SOIL SURVEY OF

Vanderburgh County, Indiana

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Purdue University Agricultural
Experiment Station

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.
Major fieldwork for this soil survey was completed in the period 1969-71. Soil names and descriptions were approved in 1972. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1972. This survey was made cooperatively by the Soil Conservation Service and the Purdue University Agricultural Experiment Station. It is part of the technical assistance furnished to the Vanderburgh County Soil and Water Conservation District. Partial funding of this soil survey was provided by Vanderburgh County through the budget of the Vanderburgh County Council.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, sanitary landfills, sewage lagoons, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Vanderburgh County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the tree and shrub group in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units and tree and shrub groups.

Foresters and others can refer to the section "Woodland," where the soils of the county are grouped according to their suitability for both trees and shrubs.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, schools, sanitary landfills, and sewage lagoons in the section "Town and Country Planning." They can find, in the section "Recreation," suitability of the soils for recreation uses.

Engineers and builders can find, under "Engineering Uses of Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Vanderburgh County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information given in the section "General Nature of the County" and in the information about the county given at the beginning of the publication.

Cover: A typical landscape in the Zanesville-Wellston soil association. Areas such as this are well suited to wildlife habitat and recreational facilities.

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SOIL SURVEY OF VANDERBURGH COUNTY, INDIANA

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

VANDERBURGH COUNTY, in the southwestern part of Indiana (fig. 1), has an area of 241 square miles, or 154,240 acres. Evansville, in the southern part of the county and along the Ohio River, is the county seat. It has a population of 138,764. The total population of the county in 1970 was 168,772.

Much of the county is on uplands, and the soils are gently sloping to steep. Many of the bottom lands, including those along the Ohio River, are subject to flooding. Soils on the terraces of the Ohio River and soils in lakebeds are mostly nearly level. In many places escarpments separate terraces from bottom lands. A large part of the terrace and lakebed areas are urban land. Most of the rest of the Ohio River terraces, lakebeds, and bottom lands are used for grain farming. The uplands are used mostly for general farming, urban development, recreation, wildlife habitat, and growing trees.

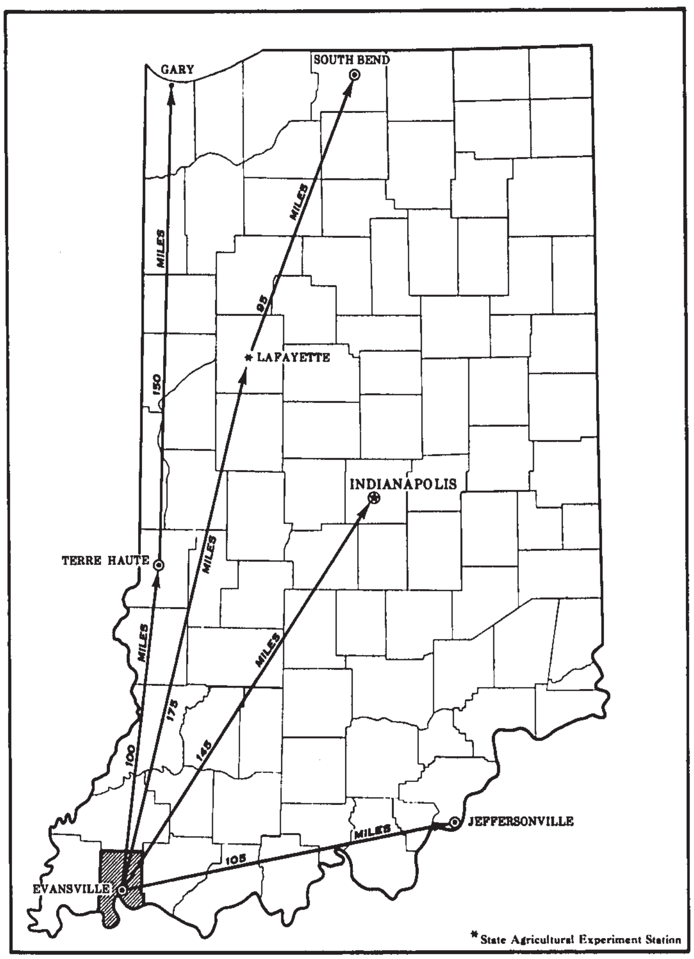

Figure 1.—Location of Vanderburgh County in Indiana.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Vanderburgh County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of the slopes, the size and spread of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Hosmer and Evansville, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Alford silt loam, 2 to 6 percent slopes, eroded, is one of several phases within the Alford series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

In most areas surveyed there are places where the soil material is so disturbed, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Gullied land is a land type in Vanderburgh County.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops under the defined practices are assembled from farm records and from field or plot experiments on the same kind of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants, and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or a high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil and they relate this failure to the high shrink-well potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultations. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Vanderburgh County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, drainage, and other characteristics that affect their management.

The names of some soil associations are unlike those appearing on recently published surveys in adjacent counties. This is because of different percentages of major soils in the associations or because of a change in concept regarding the application of the classification system to series designation.

The eight soil associations in Vanderburgh County are discussed in the following paragraphs.

1. Hosmer Association

Deep, well-drained, nearly level to strongly sloping, medium-textured soils on uplands

In this association (fig. 2) are nearly level and gently sloping soils on ridgetops and moderately sloping and strongly sloping soils on side slopes.

This association makes up about 27 percent of the county. About 70 percent of it is Hosmer soils, and 30 percent is minor soils.

Hosmer soils are on tops and sides of ridges. They are nearly level to strongly sloping and are well drained. These soils formed in 4 to 8 feet of loess underlain by sandstone and shale bedrock. The surface layer is brown silt loam, and the subsoil, to a depth of about 30 inches, is mostly strong-brown light clay loam. A firm and brittle fragipan is at a depth of about 30 inches. At this depth the soil material is yellowish-brown and strong-brown silt loam that is streaked with gray.

Among the minor soils in this association are the Wellston, Zanesville, Stendal, Birds, Bonnie, and Wilbur soils. Wellston soils are well drained. They are on short side slopes and breaks adjacent to drainageways. Zanesville soils, also well drained, are on side slopes. The somewhat poorly drained Stendal, poorly drained Bonnie and Birds, and moderately well drained Wilbur soils are on bottom lands near creeks.

Soils of this association are suited to crops (fig. 3), hay, pasture, and trees. Hazards of erosion and runoff and moderate available water capacity are concerns in use and management. The major limitations for uses associated with town and country planning are the very slow permeability of the fragipan, the steepness of slope, and the hazard of erosion.

2. Zanesville-Wellston Association

Deep, well-drained, moderately sloping to very steep, medium-textured soils on uplands

In this association are moderately sloping soils on sides of drainageways and strongly sloping to very steep soils on side slopes below ridgetops.

This association makes up about 16 percent of the county. About 45 percent of it is Zanesville soils, 30 percent is Wellston soils, and 25 percent is minor soils (fig. 4).

Zanesville soils are on sides of ridges. They are mostly moderately sloping to strongly sloping. These soils formed in about 40 inches of loess and the underlying material that weathered from sandstone and shale bedrock. The surface layer is dark yellowish-brown silt loam, and the subsoil, to a depth of about 26 inches, is strong-brown light silty clay loam

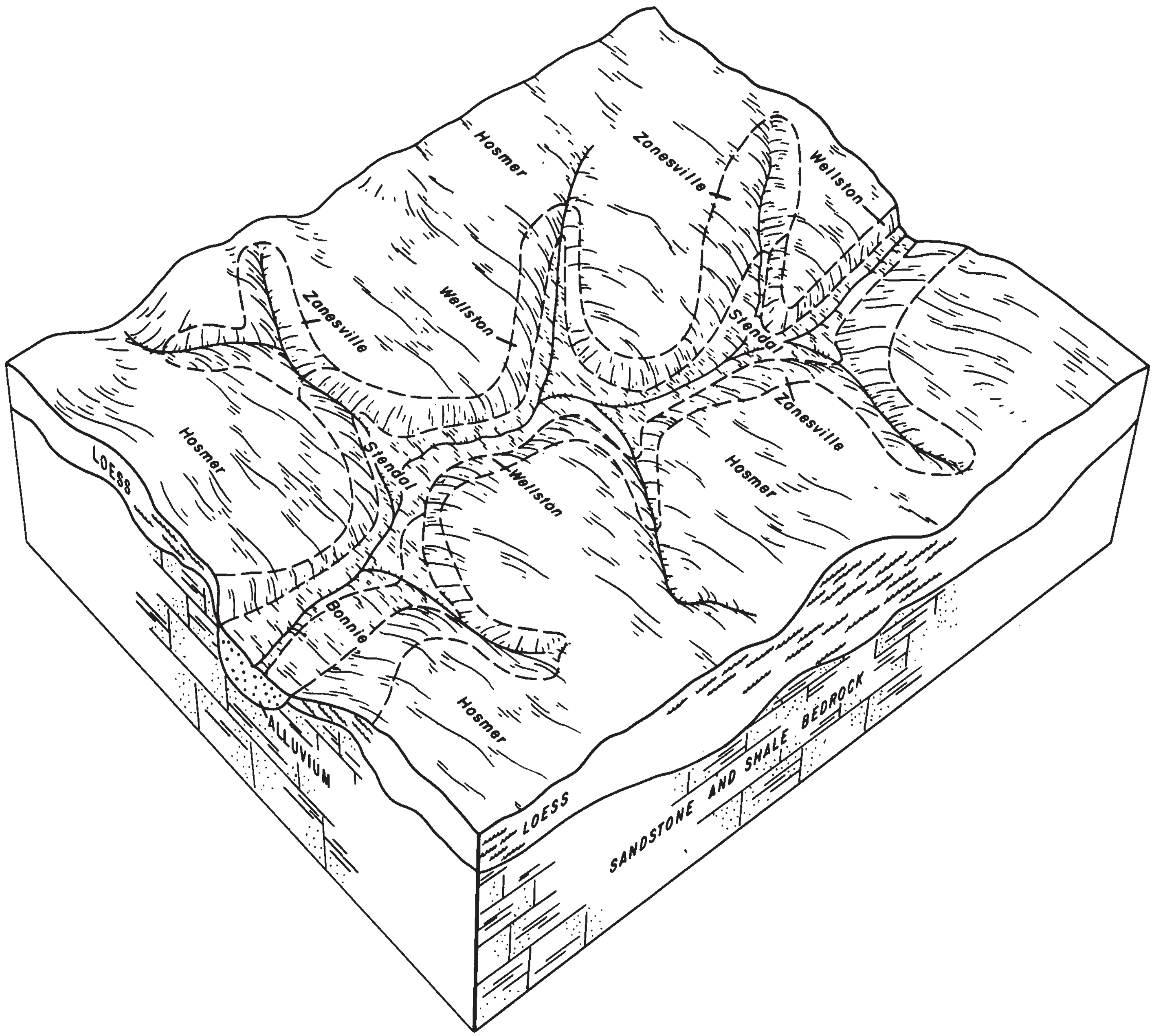

***Figure 2.*—Parent material, position in landscape, and pattern of soils in the Hosmer association.**

and heavy silt loam. A very firm and brittle fragipan is at a depth of about 26 inches. At this depth the soil material is strong-brown and yellowish-brown heavy silt loam and silt loam.

Wellston soils are on short side slopes and breaks adjacent to drainageways (fig. 5). They are strongly sloping to very steep. These soils formed in loess and material weathered from sandstone and shale bedrock. The surface layer is brown silt loam. The subsoil is brown, strong-brown, and yellowish-brown silt loam and light silty clay loam.

Among the minor soils in this association are the Hosmer, Muren, and Stendal soils. Hosmer soils are well drained and are on ridgetops. Muren soils are moderately well drained. They are on ridgetops and at the base of slopes. The somewhat poorly drained Stendal soils are on bottom lands.

Soils of this association are suited to and used for crops, hay, pasture, and trees. Hazards of erosion and runoff, a very slowly permeable fragipan, and steepness of slope are concerns in use and management. The major limitations for uses associated with town and country planning are the very slow permeability of the fragipan, the steepness of slope, and the hazard of erosion.

3. Huntington-Lindside Association

Deep, well drained and moderately well drained, nearly level, moderately fine textured soils on bottom lands

This association is on bottom lands (fig. 6). It makes up about 13 percent of the county. About 40 percent of the

Figure 3.—**An area of gently sloping and moderately sloping Hosmer soils that is used for general farming.**

association is Huntington soils, 30 percent is Lindside soils, and 30 percent is minor soils (fig. 7).

Huntington soils are well-drained, nearly level soils on broad bottom lands. These soils formed in mixed alluvium derived from Ohio River sediment. The surface layer is dark-brown silty clay loam. The subsoil is dark-brown and dark yellowish-brown light silty clay loam and heavy silt loam.

Lindside soils are moderately well drained and are adjacent to and in slightly lower positions than Huntington soils. The surface layer is dark-brown silty clay loam. The subsoil is dark-brown light silty clay loam that is mottled below a depth of about 20 inches.

Among the minor soils in this association are the Rahm, Newark, and Woodmere soils. Rahm and Newark soils are somewhat poorly drained and are on low terraces and on Ohio River bottom lands, respectively. The well-drained Woodmere soils are on low terraces.

Soils of this association are used mostly for cultivated crops. The soils are suited to corn and soybeans. Flooding on these soils in winter and early in spring is a major limitation to the use of these soils for small grain and hay crops.

The major limitation for uses associated with town and country planning is the hazard of flooding.

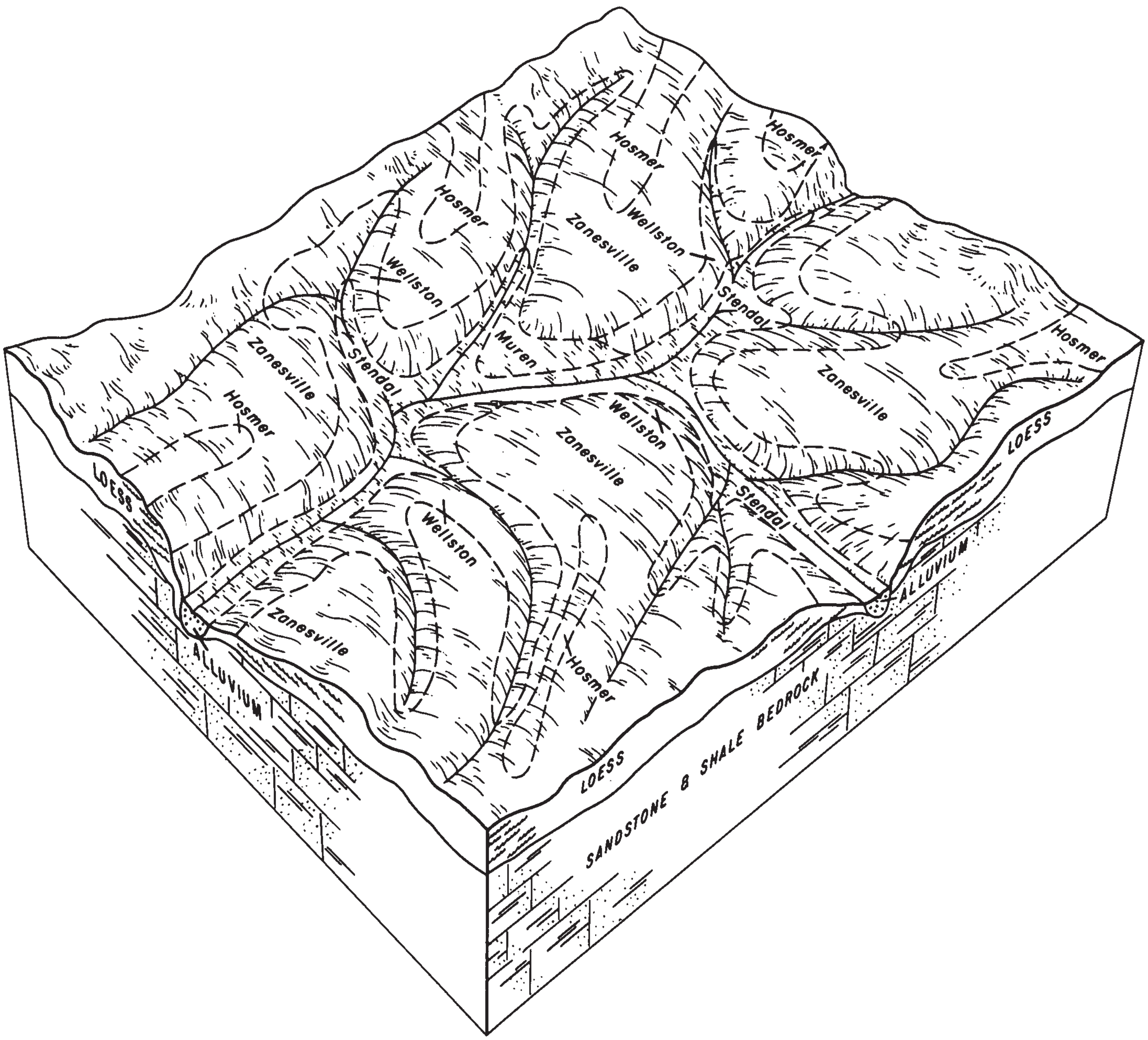

Figure 4.—**Parent material, position in landscape, and pattern of soils in the Zanesville-Wellston association.**

4. Zipp-Patton-McGary Association

Deep, very poorly drained to somewhat poorly drained, nearly level, fine textured to medium textured soils on terraces

This association is on terraces. It makes up about 13 percent of the county. About 32 percent of the association is Zipp soils, 24 percent is Patton soils, 22 percent is McGary soils, and 22 percent is minor soils (fig. 8).

Zipp soils are nearly level, very poorly drained soils on terraces. These soils formed in heavy clayey lacustrine sediment. The surface layer is dark-gray silty clay. The subsoil is mottled, dark-gray and gray silty clay.

Patton soils are nearly level, poorly drained soils on terraces. These soils formed in loamy lacustrine sediment. The surface layer is very dark gray and very dark grayish-brown silty clay loam. The subsoil is mottled, dark-gray and olive-gray silty clay loam.

McGary soils are nearly level soils on terraces. They are mostly in narrow areas near breaks and drainageways adjacent to the darker colored Patton and Zipp soils. These soils formed in a thin layer of loess and the underlying lacustrine sediments. The surface layer is grayish-brown silt loam. The subsoil is mottled, brown and grayish-brown heavy silty clay loam and silty clay.

Among the minor soils in this association are the Evansville, Birds, Markland, Henshaw, and Wakeland soils.

Figure 5.—**An area of Wellston soils being renovated for hay crops.**

Figure 6.—**A typical landscape of Huntington silty clay loam used mostly for corn and soybeans.**

The poorly drained Evansville soils are on terraces. The well-drained Markland soils are on breaks adjacent to drainageways. The somewhat poorly drained Henshaw soils are mostly at the edges of drainageways. The poorly drained Birds and somewhat poorly drained Wakeland soils are on bottom lands.

Soils of this association are used mostly for row crops. The soils are suited to corn, soybeans, small grain, hay, pasture, and trees. Major concerns in use and management are wetness, clayey texture, very slow permeability, and the hazard of flooding and surface ponding. The major limitations for uses associated with town and country planning are the seasonal high water table, surface ponding, and flooding.

5. Weinbach-Wheeling Association

Deep, somewhat poorly drained and well drained, nearly level to gently sloping, medium-textured soils on terraces

This association is on terraces. It makes up about 10 percent of the county. About 38 percent of the association is Weinbach soils, 27 percent is Wheeling soils, and 35 percent is minor soils (fig. 9).

Weinbach soils are in broad, long areas on terraces. These soils are nearly level and somewhat poorly drained. They have a very slowly permeable fragipan at a depth of about 20 inches. Weinbach soils have a surface layer of dark grayish-brown silt loam. The subsoil is dominantly mottled, light brownish-gray light silty clay loam and silty clay loam.

Wheeling soils are nearly level and gently sloping. They are in long areas on terraces. These well-drained soils have a surface layer of brown loam. The subsoil is strong-brown and brown silty clay loam, clay loam, sandy clay loam, and loam.

Among the minor soils in this association are the Sciotoville, Rahm, and Ginat soils. Sciotoville soils have a fragipan and are moderately well drained. They are in long areas on terraces. Rahm soils are somewhat poorly drained. They are on bottom lands. Ginat soils are poorly drained. They are in slight depressions on terraces (fig. 10).

Soils of this association are used mostly for row crops. They are suited to corn, soybeans, small grain, hay, pasture, and trees. Major concerns in use and management are wetness and the seasonal high water table of the somewhat poorly drained soils, erosion of the gently sloping soils, and the very slow permeability of the soils that have a fragipan. The major limitations for uses associated with town and country planning are very slow permeability, wetness, and the seasonal high water table.

6. Wakeland-Stendal-Birds Association

Deep, somewhat poorly drained and poorly drained, nearly level, medium-textured soils on bottom lands

This association is in narrow creek bottoms adjacent to uplands (fig. 11) and in broad bottom lands adjacent to terraces.

This association makes up about 9 percent of the county. About 30 percent of it is Wakeland soils, 20 percent is Stendal soils, 20 percent is Birds soils, and 30 percent is minor soils (fig. 12).

Wakeland soils are nearly level, somewhat poorly drained soils that formed in nonacid loamy alluvium. The surface layer is dark grayish-brown silt loam. The underlying material is mottled, grayish-brown silt loam.

Stendal soils are nearly level, somewhat poorly drained soils that formed in acid loamy alluvium. The surface layer is grayish-brown silt loam. The underlying material is mottled, grayish-brown and light brownish-gray silt loam.

Birds soils are nearly level, poorly drained soils that formed in slightly acid loamy alluvium. The surface layer is grayish-brown silt loam. The underlying material is mottled, gray silt loam.

Among the minor soils in this association are the Wilbur, Bartle, Evansville, and Bonnie soils. The moderately well drained Wilbur soils and the poorly drained Bonnie soils are on bottom lands. The somewhat poorly drained Bartle soils and the poorly drained Evansville soils are on terraces.

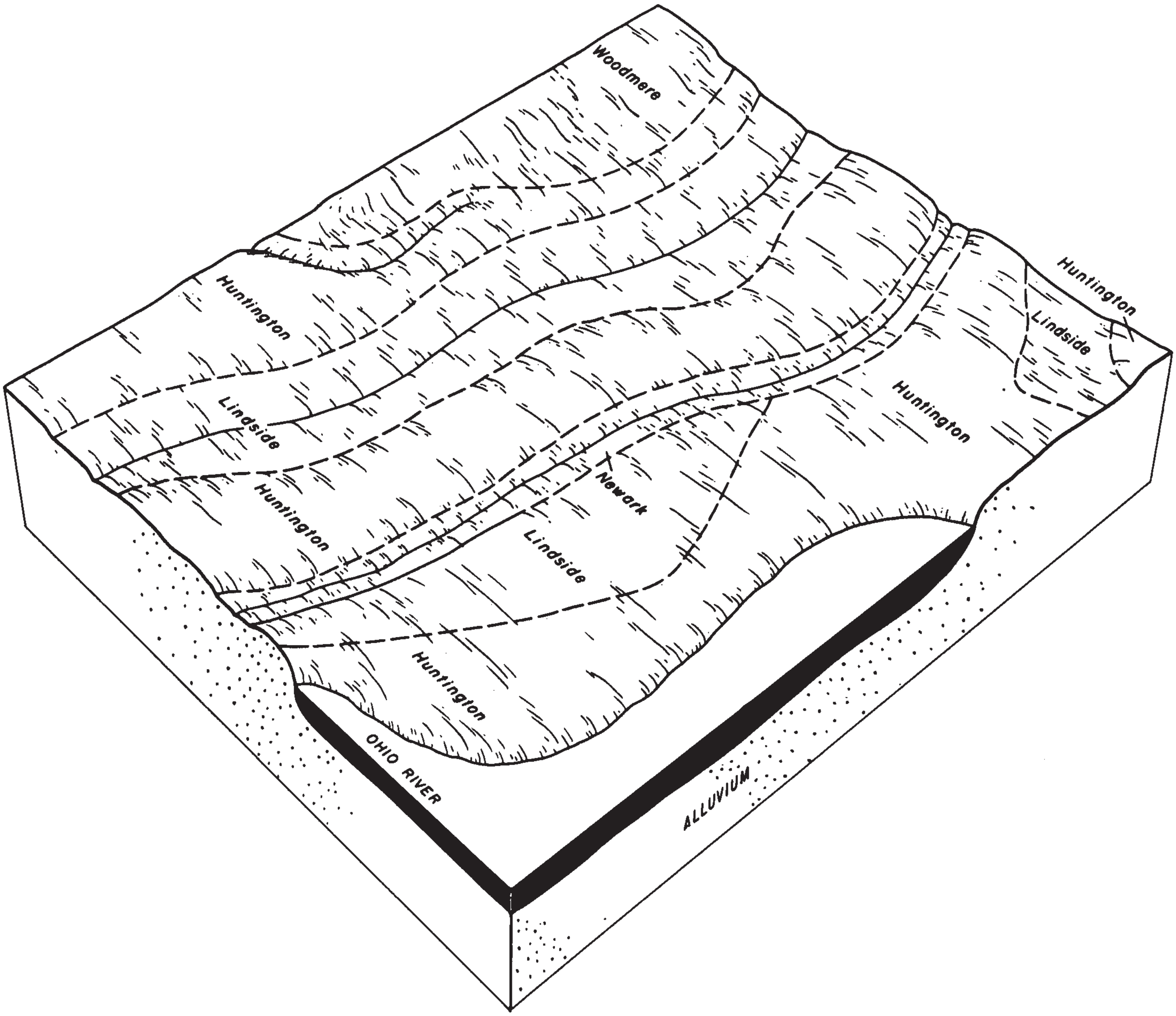

Figure 7.—**Parent material, position in landscape, and pattern of soils in the Huntington-Lindside association.**

Soils of this association are suited to crops, hay, pasture, and trees. The soils are used mostly for row crops. Major concerns in use and management of these soils are flooding and wetness. The major limitations for uses associated with town and country planning are the high water table and flooding.

7. Alford-Muren Association

Deep, well drained and moderately well drained, nearly level to strongly sloping, medium-textured soils on uplands

In this association are moderately sloping and strongly sloping soils on side slopes adjacent to drainageways and nearly level and gently sloping soils on ridgetops, side slopes, and toe slopes at the base of more steeply sloping soils.

This association makes up about 8 percent of the county. About 45 percent of it is Alford soils, 20 percent is Muren soils, and 35 percent is minor soils (fig. 13).

Alford soils are on narrow ridgetops and side slopes. In areas on narrow ridgetops the soils are gently sloping, and in areas on side slopes they are moderately sloping and strongly sloping. These well-drained soils formed in more than 5 feet of loess. The surface layer is brown silt loam. The subsoil is brown and strong-brown light silty clay loam and silt loam.

Muren soils are nearly level and gently sloping. They are on ridgetops and side slopes and in small areas at the toe of more steeply sloping soils. These moderately well drained soils formed in more than 5 feet of loess. The surface layer is yellowish-brown silt loam. The subsoil is mottled, dark

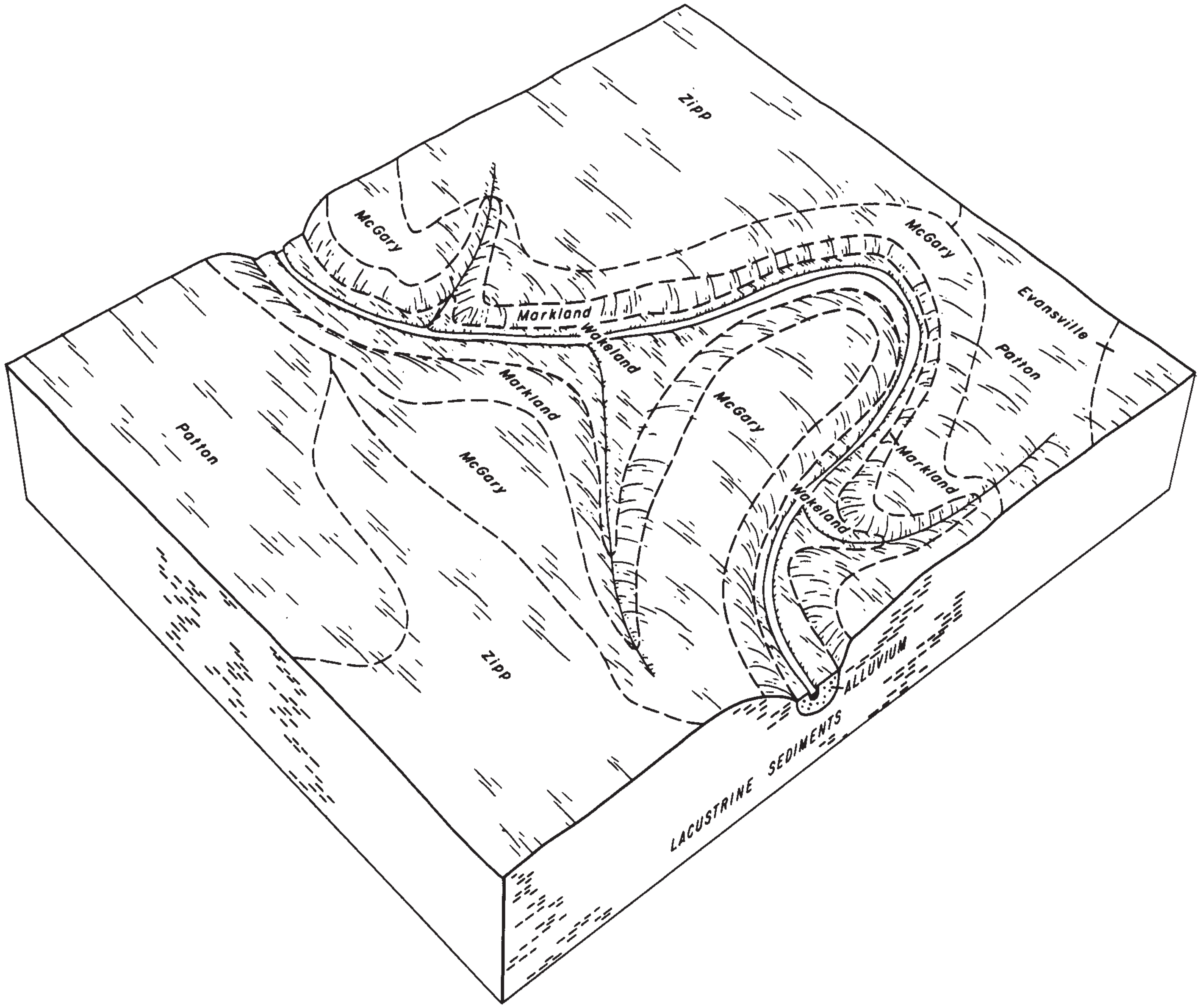

Figure 8.—**Parent material, position in landscape, and pattern of soils in the Zipp-Patton-McGary association.**

yellowish-brown and yellowish-brown light silty clay loam, silty clay loam, and heavy silt loam.

Among the minor soils in this association are the somewhat poorly drained Iva, Reesville, Henshaw, and Wakeland soils, and the well-drained Markland and Wellston soils. The Iva and Reesville soils are on uplands. The Markland soils are on terrace breaks between areas of nearly level Henshaw soils on terraces and areas of Wakeland soils in bottom lands. The Wellston soils are strongly sloping to very steep. They are on uplands adjacent to drainageways.

Soils of this association are used for, and suited to, crops, hay, pasture, and trees. Major hazards to use and management are erosion and runoff. The major limitations for uses associated with town and country planning are the moderately slow permeability of Muren soils, steepness of slope, and the hazard of erosion.

8. Reesville-Ragsdale Association

Deep, somewhat poorly drained and very poorly drained, nearly level, medium-textured soils on uplands and in lakebeds

This association is on nearly level uplands and in lakebeds.

This association makes up about 4 percent of the county. About 36 percent of it is Reesville soils, 35 percent is Ragsdale soils, and 29 percent is minor soils (fig. 14).

Reesville soils are on uplands and in lakebeds. These soils are nearly level and somewhat poorly drained. They formed in more than 5 feet of loess. The surface layer is dark grayish-brown silt loam. The subsoil is mottled, pale-brown and yellowish-brown heavy silt loam and silty clay loam.

Ragsdale soils are on uplands. These soils are nearly level and very poorly drained. They are adjacent to Reesville soils, but are in slight depressions. The Ragsdale soils

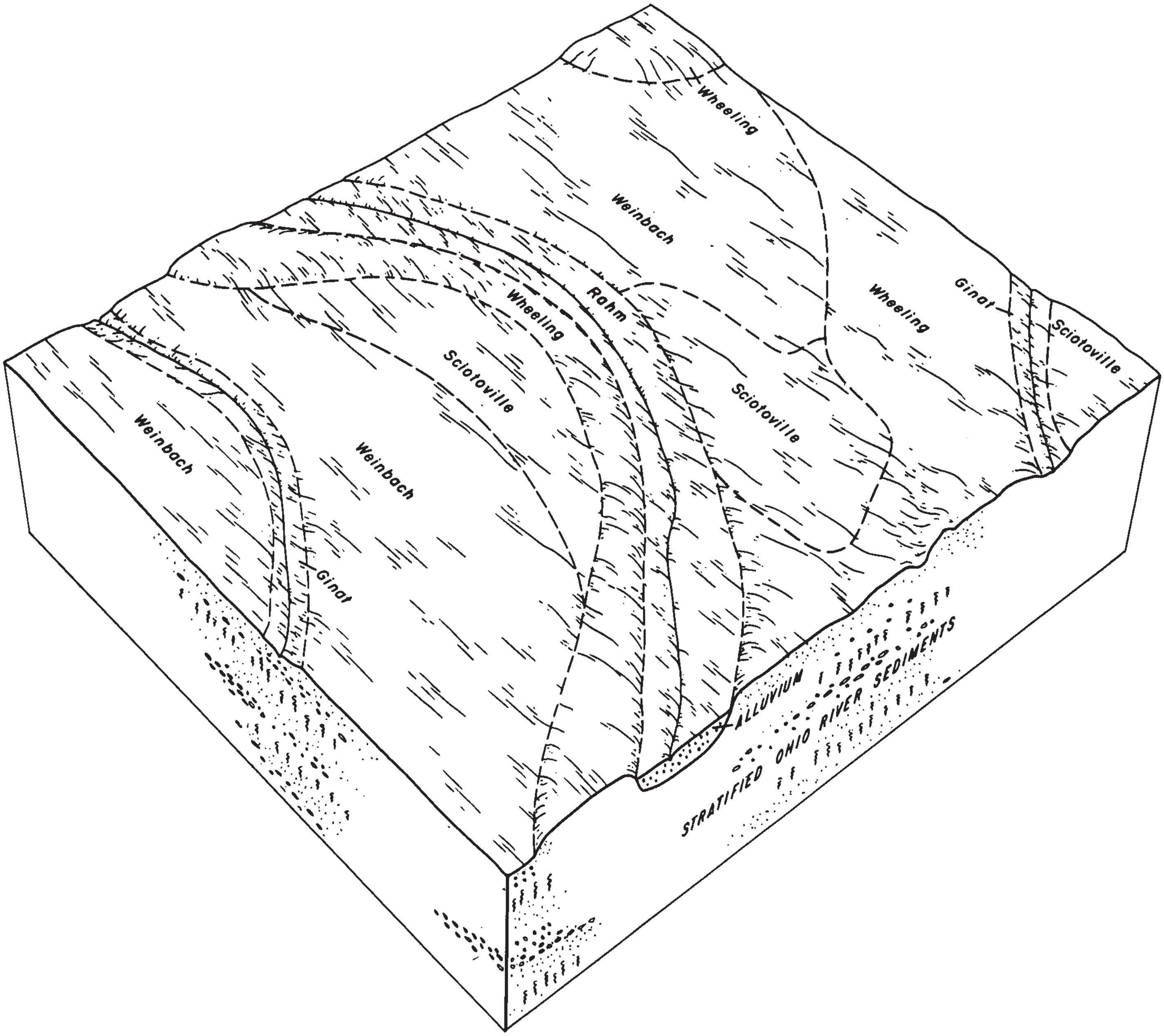

Figure 9.—**Parent material, position in landscape, and pattern of soils in the Weinbach-Wheeling association.**

formed in more than 5 feet of loess. The surface layer is silt loam. It is very dark brown in the upper part and very dark gray in the lower part. The subsoil is mottled, gray and light olive-brown silty clay loam.

Among the minor soils in this association are the Iona, Evansville, Patton, Wakeland, and Birds soils. The moderately well drained Iona soils are on low ridges, side slopes, and toe slopes of the uplands. The poorly drained Evansville and Patton soils are on terraces. The somewhat poorly drained Wakeland and poorly drained Birds soils are on bottom lands.

Soils of this association are used mostly for row crops. The soils are suited to corn, soybeans, small grain, hay, pasture, and trees. Major limitations to use and management of these soils are wetness and surface ponding. The major limitations for uses associated with town and country planning are slow or moderately slow permeability of some soils, seasonal high water tables, wetness, and surface ponding.

Descriptions of the Soils

This section describes the soil series and mapping units in Vanderburgh County. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the

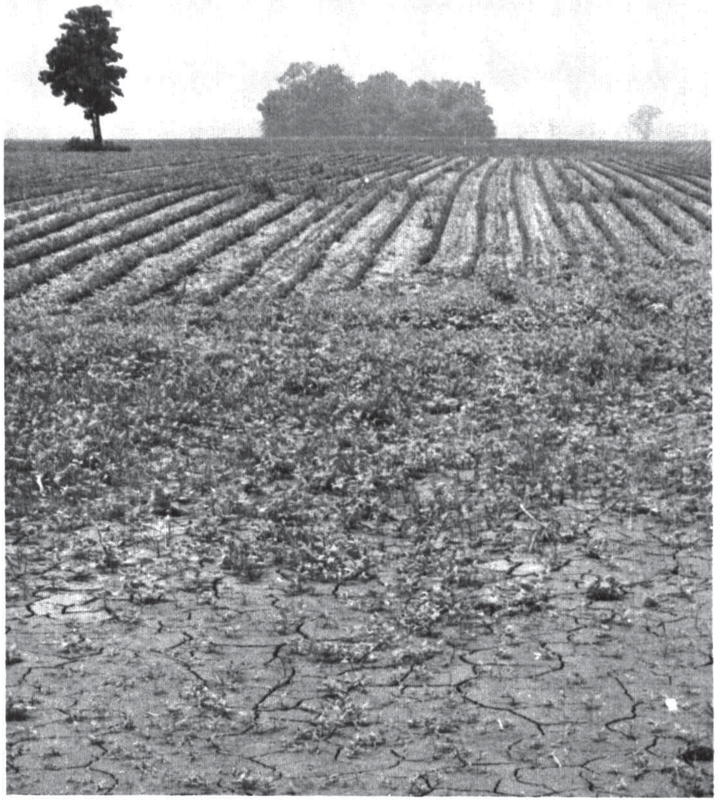

***Figure 10.*—Weinbach-Wheeling soils showing a small area of the minor Ginat soil in the foreground where soybeans have been destroyed by water.**

***Figure 11.*—Wakeland soils in corn adjacent to the moderately sloping to very steep soils of the Zanesville-Wellston association.**

surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit. Color terms are for moist soil unless otherwise stated.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Gullied land and Made land, for example, do not belong to a soil series, but nevertheless, are listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit in which the mapping unit has been placed. The page for the description of each capability unit and tree and shrub group can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

The names of the soils are unlike those appearing on recently published surveys in adjacent counties. This is because of a change in concept regarding the application of the soil classification system to series designation. In joining with Henderson County, Kentucky, areas of Huntington soils are joined with areas of Egam soils. These soils have similar characteristics, but Egam soils are not extensive in Vanderburgh County and therefore are included with Huntington soils in mapping.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*10*).[1]

Alford Series

The Alford series consists of deep, well-drained, gently sloping to strongly sloping soils on uplands. These soils formed in more than 5 feet of loess. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is brown silt loam about 8 inches thick. The subsoil, about 44 inches thick, is firm, strong-brown light silty clay loam in the upper 33 inches and firm, brown silt loam in the lower 11 inches. The underlying material, to a depth of 72 inches, is brown silt loam.

Available water capacity is high in Alford soils, and permeability is moderate. The content of organic matter is low.

Representative profile of Alford silt loam, 2 to 6 percent slopes, eroded, in a cultivated field, 1,010 feet west and 680 feet south of the NE. corner of NW¼ sec. 32, T. 6 S., R. 11 W.:

[1]Italic numbers in parentheses refer to Literature Cited, p. 90.

Ap—0 to 8 inches, brown (10YR 5/3) silt loam; weak, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.
B1—8 to 11 inches, brown (7.5YR 5/4) heavy silt loam; moderate, fine, subangular blocky structure; friable; few, thin, patchy, yellowish-brown (10YR 5/4) and very dark brown (10YR 2/2) silt and clay coatings on faces of peds; medium acid; clear, wavy boundary.
B21t—11 to 20 inches, strong-brown (7.5YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; firm; thin, continuous, dark-brown (7.5YR 4/4) and very dark brown (10YR 2/2) clay films on faces of peds; strongly acid; clear, smooth boundary.
B22t—20 to 41 inches, strong-brown (7.5YR 5/5) light silty clay loam; moderate, medium and coarse, subangular blocky structure; firm; thin, continuous, reddish-brown (5YR 4/4) and very dark brown (10YR 2/2) clay films on faces of peds; strongly acid; clear, wavy boundary.
B3—41 to 52 inches, brown (7.5YR 5/4) silt loam; weak, very coarse, subangular blocky structure; firm; discontinuous, reddish-brown (5YR 5/4) clay films on faces of peds; few pale-brown (10YR 6/3) silt streaks in cracks; strongly acid; gradual, wavy boundary.
C—52 to 72 inches, brown (7.5YR 5/4) silt loam; massive; friable; streaks of light-gray (10YR 7/2) silt in places; medium acid.

The Ap horizon ranges from brown to dark grayish brown in color. In places a brown A2 horizon is present in these soils. The B2t horizon is strong-brown (7.5YR 5/6) to yellowish-brown (10YR 5/4) heavy silt loam to silty clay loam. Reaction in the C horizon is medium acid or slightly acid.

Alford soils are associated with Hosmer and Wellston soils. They lack the fragipan of Hosmer soils, and they have a thicker solum than Wellston soils.

Alford silt loam, 2 to 6 percent slopes, eroded (AlB2).—This soil is on narrow ridgetops. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of moderately well drained Muren soils that have gray mottles. Also included are spots of severely eroded soils that are indicated on the map by a special symbol. In these severely eroded areas the surface layer is mostly brown and strong-brown material that was formerly in the subsoil.

Runoff is medium on this soil, and runoff and erosion are major hazards in use and management. If this soil is properly managed, it is suited to crops. It is well suited to orchards. Because of the moderate permeability, this soil has slight limitations for residential use whether a public sewer system is available or not. Erosion control is needed where residential areas are being developed. Seedbeds are generally cloddy in the spots of severely eroded soils, and as a result stands are poorer in these areas than they are elsewhere. Capability unit IIe-3.

Alford silt loam, 6 to 12 percent slopes, eroded (AlC2).—This soil is on sides of natural draws, at heads of drainageways, and in areas below ridgetops where slopes are short. The surface layer and subsoil are thinner than those described as representative of the series, but the soil is otherwise similar.

Included with this soil in mapping are areas where the slope is more than 12 percent. These areas, 2 to 10 acres in size, are mostly wooded or in permanent pasture. Also included are spots of severely eroded soils that generally have a surface layer of brown and strong-brown heavy silt loam and light silty clay loam. These spots are indicated on the map by a special symbol.

Runoff and erosion are the major hazards to use and management of this soil. If it is properly managed, the soil is suited to all crops commonly grown in the county. It is well suited to orchards. Because of slope, moderate permeability,

TABLE 1—*Approximate acreage and proportionate extent of soils*

Soil	Acres	Percent
Alford silt loam, 2 to 6 percent slopes, eroded	5,600	3.0
Alford silt loam, 6 to 12 percent slopes, eroded	610	.4
Alford silt loam, 6 to 12 percent slopes, severely eroded	3,150	2.1
Alford silt loam, 12 to 18 percent slopes, severely eroded	1,100	.8
Bartle silt loam	1,000	.7
Birds silt loam	4,150	2.6
Bonnie silt loam	850	.6
Borrow pits	264	.1
Evansville silt loam	3,350	2.1
Ginat silt loam	1,200	.7
Gullied land	760	.5
Henshaw silt loam	2,000	1.3
Hosmer silt loam, 0 to 2 percent slopes	820	.5
Hosmer silt loam, 2 to 6 percent slopes, eroded	20,000	12.9
Hosmer silt loam, 2 to 6 percent slopes, severely eroded	1,100	.8
Hosmer silt loam, 6 to 12 percent slopes, eroded	1,700	1.1
Hosmer silt loam, 6 to 12 percent slopes, severely eroded	10,000	6.4
Hosmer silt loam, 12 to 18 percent slopes, severely eroded	1,050	.6
Huntington silty clay loam	14,300	9.2
Huntington fine sandy loam, sandy variant	560	.3
Iona silt loam, 0 to 2 percent slopes	670	.4
Iona silt loam, 2 to 6 percent slopes, eroded	1,400	1.0
Iva silt loam	1,050	.7
Lindside silty clay loam	5,000	3.2
Made land	260	.1
Markland silt loam, 2 to 6 percent slopes, eroded	920	.6
Markland silt loam, 6 to 18 percent slopes, eroded	395	.2
Markland silty clay loam, 6 to 18 percent slopes, severely eroded	820	.5
McGary silt loam	2,900	1.8
Muren silt loam, 0 to 2 percent slopes	640	.4
Muren silt loam, 2 to 6 percent slopes, eroded	2,500	1.6
Newark silty clay loam	900	.5
Patton silty clay loam	2,950	1.9
Princeton fine sandy loam, 2 to 6 percent slopes	345	.2
Ragsdale silt loam	1,500	1.0
Rahm silty clay loam	780	.5
Reesville silt loam	3,000	1.9
Sciotoville silt loam, 0 to 2 percent slopes	3,000	1.9
Sciotoville silt loam, 2 to 6 percent slopes, eroded	580	.3
Stendal silt loam	5,500	3.6
Uniontown silt loam, 2 to 6 percent slopes, eroded	740	.4
Wakeland silt loam	6,900	4.5
Weinbach silt loam	6,000	4.2
Wellston silt loam, 12 to 18 percent slopes, eroded	1,200	.9
Wellston silt loam, 12 to 18 percent slopes, severely eroded	2,950	2.1
Wellston silt loam, 18 to 25 percent slopes, eroded	4,280	3.3
Wellston silt loam, 25 to 50 percent slopes	910	.6
Wheeling loam, 0 to 2 percent slopes	1,770	1.2
Wheeling loam, 2 to 6 percent slopes, eroded	1,770	1.2
Wilbur silt loam	3,300	2.1
Woodmere silty clay loam	1,850	1.2
Zanesville silt loam, 6 to 12 percent slopes, eroded	236	.1
Zanesville silt loam, 6 to 12 percent slopes, severely eroded	3,700	2.4
Zanesville silt loam, 12 to 18 percent slopes, eroded	660	.4
Zanesville silt loam, 12 to 18 percent slopes, severely eroded	2,950	2.0
Zipp silty clay	4,750	3.1
Water	1,600	1.3
Total	154,240	100.0

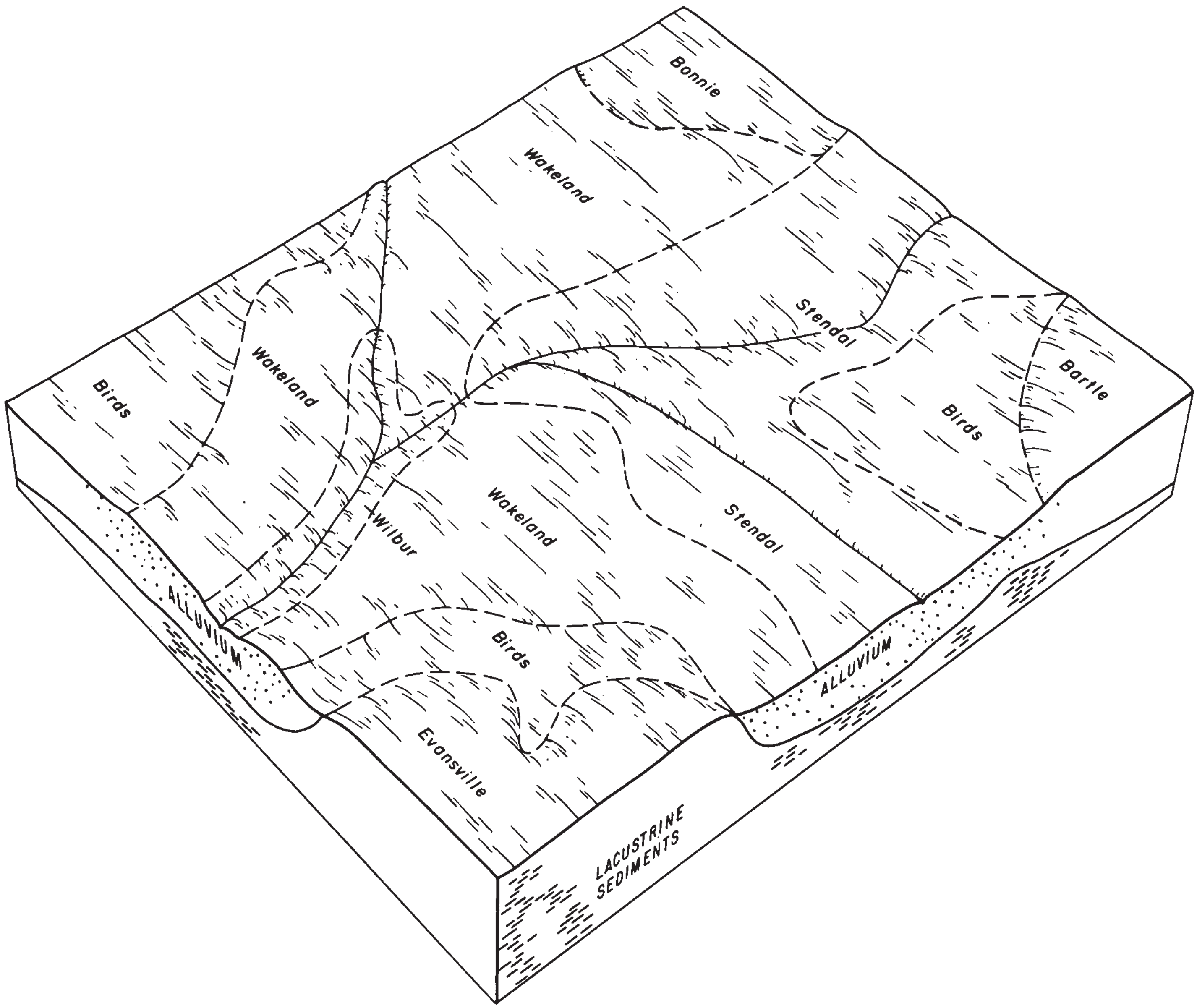

Figure 12.—**Parent material, position in landscape, and pattern of soils in the Wakeland-Stendal-Birds association.**

and hazard of erosion, this soil has moderate limitations for residential use whether a public sewer system is available or not. Seedbeds are generally cloddy in the spots of severely eroded soils, and runoff is faster in these areas than it is elsewhere. Capability unit IIIe-3.

Alford silt loam, 6 to 12 percent slopes, severely eroded (AlC3).—This soil is on the sides of natural draws and in areas below ridgetops where slopes are short. It has a profile similar to that described as representative of the series, but erosion has removed 6 inches to all of the original surface layer. The present surface layer is mostly brown and strong-brown subsoil material. Numerous small gullies are present.

Included with this soil in mapping are small areas of moderately eroded soils. Also included are small areas where a weakly developed fragipan is present.

Runoff is rapid on this soil, and the hazard of further erosion is the major hazard to use and management. This soil is suited to small grain, hay, and pasture. It is also well suited to orchards.

Seedbeds in this soil are often cloddy, and poor seed germination results. Because of slope and erosion, this moderately permeable soil has moderate limitations for residential development. Capability unit IVe-3.

Alford silt loam, 12 to 18 percent slopes, severely eroded (AlD3).—This soil is on the sides of natural draws. It has a profile similar to that in the soil described as representative of the series, but this soil is thinner than that one, and erosion has removed 6 inches to all of the original surface layer. The present surface layer is mostly brown and strong-brown subsoil material. Numerous gullies are present.

Included with this soil in mapping are small areas of moderately eroded soils. These areas are 3 to 12 acres in size and are in permanent pasture or are wooded. Also included are areas where slope is more than 18 percent.

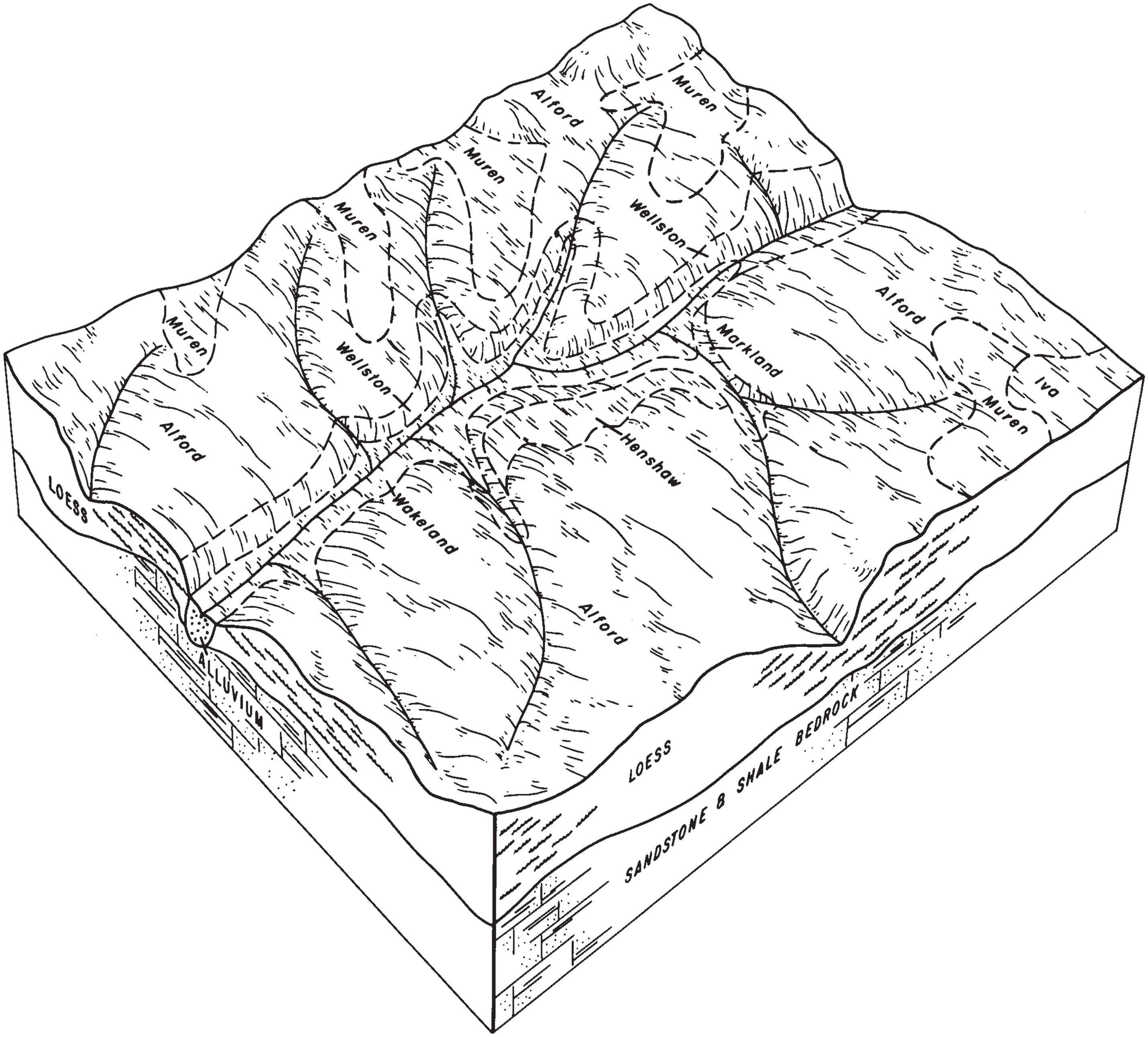

Figure 13.—**Parent material, position in landscape, and pattern of soils in the Alford-Muren association.**

Runoff is very rapid on this soil, and the hazard of further erosion is the major limitation to use and management. This soil is suited to hay and pasture. It is also well suited to orchards. The hazard of further erosion limits the use of this soil for row crops.

Because of slope and the hazard of further erosion, this moderately permeable soil has severe limitations for residential development. The need for excavations, cuts, and fills are also limitations to such use. Capability unit VIe-1.

Bartle Series

The Bartle series consists of deep, somewhat poorly drained, nearly level soils on terraces. These soils formed in old alluvium made up of silt loam and silty clay loam. They have a very firm and brittle fragipan at a depth of about 2 to 2½ feet. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is grayish-brown silt loam about 9 inches thick. The subsurface layer is mottled, pale-brown silt loam about 7 inches thick. The subsoil is about 37 inches thick. The upper 11 inches is mottled, gray, firm heavy silt loam, and the lower 26 inches is a fragipan of mottled, light brownish-gray, very firm and brittle silt loam and light silty clay loam. The underlying material, to a depth of 60 inches, is mottled, light brownish-gray, stratified silt loam and silty clay loam.

Available water capacity is moderate in Bartle soils, and permeability is very slow. The content of organic matter is

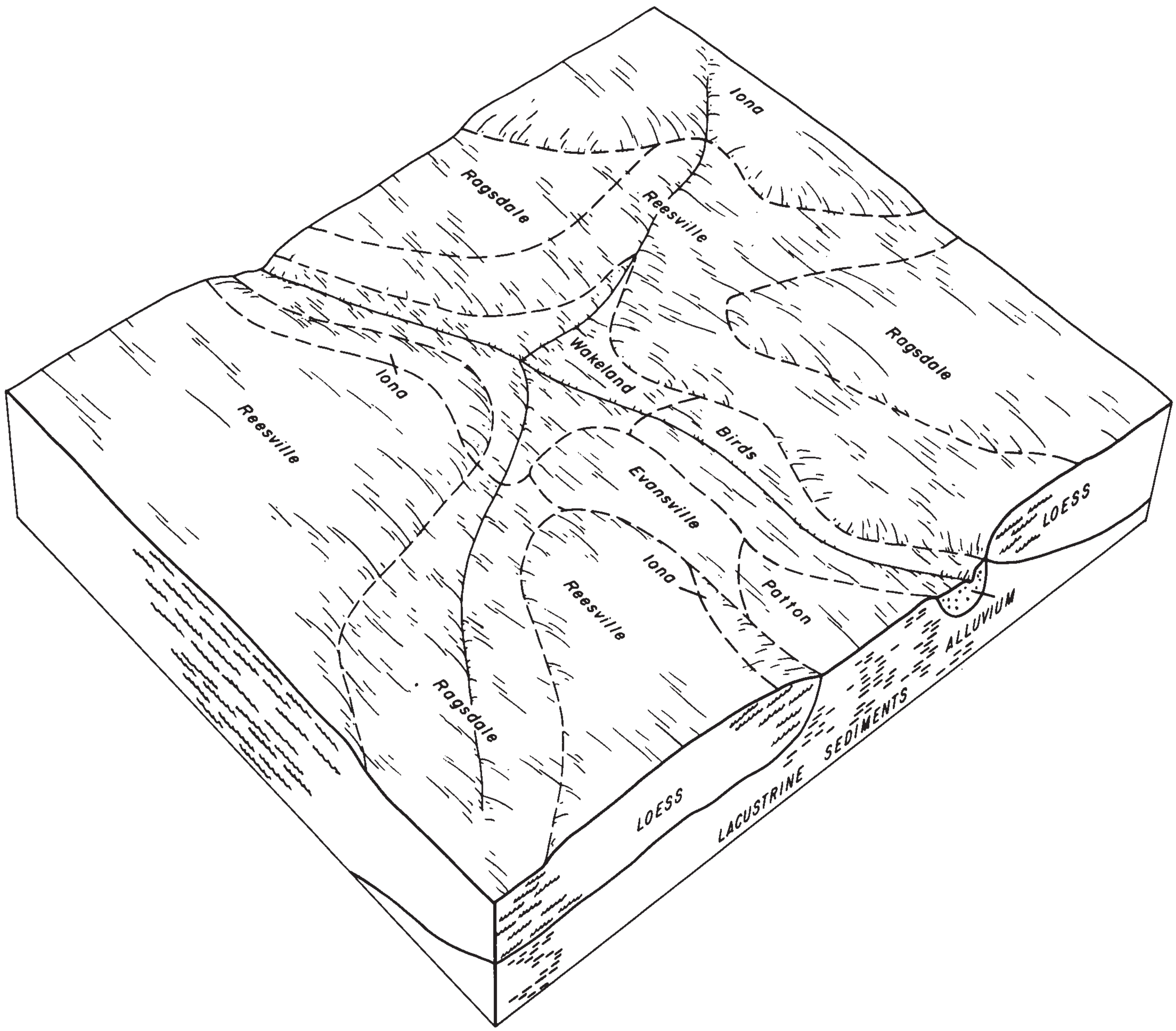

Figure 14.—**Parent material, position in landscape, and pattern of soils in the Reesville-Ragsdale association.**

low. These soils have a seasonal high water table.

Representative profile of Bartle silt loam in a cultivated field, 660 feet east and 410 feet south of the NW. corner of SW¼ sec. 28, T. 5 S., R. 10 W.:

Ap—0 to 9 inches, grayish-brown (10YR 5/2) silt loam; weak, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—9 to 16 inches, pale-brown (10YR 6/3) silt loam; many, fine, distinct, yellowish-brown (10YR 5/6) and light-gray (10YR 7/2) mottles; weak, medium, platy structure; friable; medium acid; clear, smooth boundary.

B2tg—16 to 27 inches, gray (10YR 6/1) heavy silt loam; many, fine, distinct, yellowish-brown (10YR 5/6) mottles; thin, discontinuous, light-gray (10YR 7/2) clay and silt films on the faces of peds and linings of voids; weak, coarse, prismatic structure that parts to moderate, medium, subangular blocky; firm; strongly acid; clear, irregular boundary.

Bx1g—27 to 44 inches, light brownish-gray (10YR 6/2) heavy silt loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, very coarse, prismatic structure; very firm and brittle; thick, continuous, gray (10YR 6/1) and light-gray (10YR 7/2) silt films on faces of peds and in cracks; few very dark brown (10YR 2/2) iron and manganese concretions; very strongly acid; clear, wavy boundary.

Bx2g—44 to 53 inches, light brownish-gray (10YR 6/2) light silty clay loam; many, fine, distinct, strong-brown (7.5YR 5/8) mottles; weak, very coarse, prismatic structure; very firm and brittle; thick, continuous, gray (10YR 6/1) clay films in cracks and on faces of peds; few very dark brown (10YR 2/2) iron and manganese concretions; very strongly acid; diffuse, wavy boundary.

Cg—53 to 60 inches, light brownish-gray (10YR 6/1) stratified silt loam and silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/8) mottles; massive, friable; slightly acid.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2) or brown (10YR 5/3) in color. The Bx horizon ranges from silt loam to light silty clay loam. The fragipan ranges in depth from 22 to 34 inches. It is weak to moderately expressed and is

Figure 15.—**Alkaline area in a cultivated field shows lack of crop growth.**

strongly acid or very strongly acid. The C horizon commonly has strata of fine sand in some places. It is medium acid or slightly acid.

Bartle soils have drainage characteristics similar to those of Iva soils. They have a fragipan that Iva soils lack.

Bartle silt loam (0 to 2 percent slopes) (Ba).—This soil is on terraces that are near the base of uplands and are adjacent to somewhat poorly drained and poorly drained soils on bottom lands. Included in mapping are small areas of poorly drained soils. Also included are small very light colored alkaline areas. These areas are 50 to 100 feet in diameter and are shown on the map by a spot symbol (fig. 15).

Runoff is slow on this soil. Wetness and the very slowly permeable fragipan are the major limitations in use and management. The fragipan restricts downward root growth and movement of water. If a suitable drainage system is established and maintained, this soil is suited to most crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops. Alfalfa and other deep-rooted crops are not well suited, because the fragipan restricts downward growth and movement of water.

The very slowly permeable fragipan and the seasonal high water table limit the use of this soil for residential development. Capability unit IIw-3.

Birds Series

The Birds series consists of deep, poorly drained, nearly level soils on bottom lands. These soils formed in slightly acid loamy alluvium. The native vegetation is hardwood trees.

In a representative profile the surface layer is grayish-brown silt loam about 9 inches thick. The underlying material, to a depth of about 42 inches, is mottled, gray, friable silt loam. Below this, to a depth of 60 inches, it is mottled, gray, stratified silt loam and silty clay loam.

Available water capacity is high in Birds soils, and permeability is slow. The content of organic matter is low.

Representative profile of Birds silt loam, 100 feet south and 200 feet west of the center of the NW¼ sec. 29, T. 4 S., R. 10 W.:

Ap—0 to 9 inches, grayish-brown (10YR 5/2) silt loam; weak, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

Clg—9 to 42 inches, gray (10YR 6/1) silt loam; common, medium, distinct, grayish-brown (10YR 5/2) and dark yellowish-brown (10YR 4/4) mottles; weak, medium, granular structure; friable; slightly acid; gradual, smooth boundary.

C2g—42 to 60 inches, gray (10YR 6/1) silt loam; thin layers of silty clay loam below a depth of 55 inches; common, medium, distinct, yellowish-brown (10YR 5/4) mottles; massive; friable; few light-gray (10YR 7/1) silt streaks; slightly acid.

The Ap horizon ranges from gray (10YR 6/1) to grayish brown (10YR 5/2) or light brownish gray (10YR 6/2) in color. The Clg horizon is gray

(10YR 6/1) to light brownish gray (2.5Y 6/2). It is medium acid to neutral in reaction. The C2g horizon is silt loam or clay loam. Reaction is slightly acid or neutral.

The Birds soils are associated with Wakeland and Bonnie soils. They are grayer throughout their profile than Wakeland soils. Birds soils have drainage characteristics similar to those of Bonnie soils. They are less acid than Bonnie soils.

Birds silt loam (0 to 2 percent slopes) (Bd).—This soil is on broad bottom lands along small streams and in large areas of lakebeds adjacent to uplands. Included in mapping are small areas where the surface layer is medium acid. Also included are small areas where the soil is dark gray below a depth of about 20 inches.

Runoff is very slow on this soil, or the surface is ponded. Wetness is a limitation in use and management. Flooding is a hazard in most areas. If a suitable drainage system is established and maintained, this soil is suited to most crops commonly grown in the county. Alfalfa and small grain are subject to damage from wetness and in some areas from flooding.

Because of a seasonal high water table and flooding, this soil has severe limitations for most uses associated with town and country planning. Capability unit IIIw-10.

Bonnie Series

The Bonnie series consists of deep, poorly drained, nearly level soils on bottom lands. These soils formed in alluvium of acid silt loam. The native vegetation is hardwood trees.

In a representative profile the surface layer is grayish-brown silt loam about 8 inches thick. The underlying material, to a depth of about 40 inches, is friable, mottled, grayish-brown and gray silt loam. Below this, to a depth of 60 inches, is mottled, gray and dark yellowish-brown silt loam that contains strata of silty clay loam.

Available water capacity is high in Bonnie soils, and permeability is slow. These soils have a seasonal high water table. The content of organic matter is low.

Representative profile of Bonnie silt loam in a cultivated field, 1,300 feet east and 600 feet north of the SW. corner of SE¼ sec. 35, T. 4 S., R. 10 W.:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) silt loam; few, fine, faint, gray (10YR 6/1) mottles; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

Clg—8 to 14 inches, grayish-brown (10YR 5/2) and gray (10YR 6/1) silt loam; common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; weak, thick, platy structure that parts to weak, medium, granular; friable; medium acid; clear, smooth boundary.

C2g—14 to 40 inches, gray (10YR 6/1) and light brownish-gray (10YR 6/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, granular structure; friable; strongly acid; gradual, wavy boundary.

C3g—40 to 60 inches, mottled, gray (10YR 5/1, 6/1) and dark yellowish-brown (10YR 4/4) silt loam that has thin lenses of silty clay loam; massive; friable; strongly acid.

The Ap horizon ranges from dark gray (10YR 4/1) to light brownish gray (10YR 6/2) or grayish brown (10YR 5/2). The Al horizon, in undisturbed areas, has a dark-gray (10YR 4/1) or gray (10YR 5/1) surface layer 2 to 4 inches thick. The C horizon has a hue of 10YR or 2.5Y, a value of 5 to 7, and chroma of 1 or 2. The C3g horizon is strongly acid to medium acid.

Bonnie soils are associated with Stendal and Birds soils. They have grayer C2g and C3g horizons than Stendal soils. Bonnie soils have drainage characteristics similar to those of Birds soils, but they are more acid than those soils.

Bonnie silt loam (0 to 2 percent slopes) (Bo).—This soil is on bottom lands. Areas are generally adjacent to uplands, away from the main streams in low areas where much seepage occurs and flooding is frequent.

Included with this soil in mapping are small areas of somewhat poorly drained soils. Also included are small areas of alkaline soils, high in sodium, that are 50 to 100 feet in diameter. These areas are shown on the map by spot symbols.

Runoff is very slow on this soil, or the surface is ponded. Wetness and the flooding hazard are limitations to use and management. If a suitable drainage system is established and maintained, this soil is suited to most crops commonly grown in the county. Alfalfa and small grain are subject to damage from wetness and flooding.

Because of wetness and flooding, this soil has severe limitations for most uses associated with town and country planning. Capability unit IIIw-10.

Borrow Pits

Borrow pits (Br) are places where the soil material has been removed. Most of them are 5 to 15 acres in size, but they range from 2 to 40 or more acres. One of the Borrow pits in the southwestern part of the county is an abandoned quarry, but in most cases the pits have been used as a source of highway fill and are near major highways.

Borrow pits vary in depth. Soil has been removed only to a depth of 3 or 4 feet in places, but most pits are 10 feet or more in depth. Some of the pits are permanently filled with water and have good potential for fishing and other recreational uses.

Borrow pits are mainly in Wheeling soils on terraces, in Hosmer soils on uplands, and in Huntington soils on bottom lands. Where soil material has been removed to a depth of several feet and a pit remains, the sides of the pit are generally subject to severe erosion. Exposed sides erode and add sediment to water in the pit. A permanent cover of vegetation helps to prevent further erosion and sedimentation. Capability unit VIIe-3.

Evansville Series

The Evansville series consists of deep, poorly drained, nearly level soils on terraces. These soils formed in loamy lacustrine sediment. The native vegetation is grasses, sedges, and swamp forest.

In a representative profile the surface layer is dark grayish-brown silt loam about 9 inches thick. The subsoil is firm silty clay loam about 35 inches thick. It is grayish brown in the upper 12 inches and olive gray in the lower 23 inches. It is mottled throughout. The underlying material, to a depth of 66 inches, is light olive-brown and grayish-brown stratified light silty clay loam and silty clay loam.

Available water capacity is high in Evansville soils, and permeability is moderate. These soils have a seasonal high water table. The content of organic matter is moderate.

Representative profile of Evansville silt loam in a cultivated field, 1,060 feet south and 530 feet west of the NE. corner of sec. 19, T. 6 S., R. 9 W.:

Ap—0 to 9 inches, dark grayish-brown (2.5Y 4/2) silt loam; weak, medium, granular structure; friable; neutral; abrupt, smooth boundary.

Blg—9 to 21 inches, grayish-brown (2.5Y 5/2) silty clay loam; common, medium, faint, light olive-brown (2.5Y 5/4) mottles; weak, medium, prismatic structure that parts to weak, medium, subangular blocky; firm; thin, patchy, dark-gray (10YR 4/1) coatings on faces of peds; neutral; clear, wavy boundary.

B2g—21 to 32 inches, olive-gray (5Y 5/2) silty clay loam; common, medium, distinct, grayish-brown (2.5Y .5/2) mottles; weak, coarse, prismatic structure that parts to weak, medium, sub-

angular blocky; firm; thin, discontinuous, dark-gray (5Y 4/1) coatings on faces of peds; neutral; clear, smooth boundary.

B3g—32 to 44 inches, olive-gray (5Y 5/2) silty clay loam; common, medium, distinct, light olive-brown (2.5Y 5/4) mottles; weak, coarse, subangular blocky structure; firm; thin dark-gray (5Y 4/1) coatings in cracks and on faces of peds; neutral; gradual, wavy boundary.

Cg—44 to 66 inches, light olive-brown (2.5Y 5/4) and grayish-brown (2.5Y 5/2) stratified light silty clay loam and silty clay loam; firm; massive; mildly alkaline.

The Ap horizon ranges from dark gray (10YR 4/1) to dark grayish brown (10YR 4/2 or 2.5Y 4/2) in color. The B1g and B2g horizons are grayish-brown (2.5Y 5/2) to olive-gray (5Y 5/2) silty clay loam to light silty clay loam that have common to many mottles in shades of brown. Reaction is slightly acid or mildly alkaline throughout the profile.

Evansville soils are associated with Patton, Zipp, and Henshaw soils. They have drainage characteristics similar to those of Patton soils, but Evansville soils have a lighter colored horizon than Patton soils. Evansville soils formed in less clayey material than Zipp soils, and they are grayer than Henshaw soils.

Evansville silt loam (0 to 2 percent slopes) (Ev).—This soil is in large areas on lakebed terraces. Included in mapping are small areas where the surface layer or the upper part of the subsoil is light silty clay loam.

Runoff is very slow on this soil, or the surface is ponded. Wetness is the major limitation in use and management. Areas along Pond Flat Ditch are flooded at times. If this soil is drained, it is suited to corn, soybeans, small grain, hay, and pasture.

Because of wetness and a seasonal high water table, this soil has severe limitations for most uses associated with town and country planning. Capability unit IIw-1.

Ginat Series

The Ginat series consists of deep, poorly drained, nearly level soils on terraces. These soils formed in loamy acid alluvium. The native vegetation is mixed hardwood trees.

In the representative profile the surface layer is gray silt loam about 9 inches thick. The subsurface layer, about 8 inches thick, is gray silt loam. The subsoil is gray, and it is about 46 inches thick. The upper 6 inches is friable heavy silt loam, the next 29 inches is a fragipan of very firm and brittle light silty clay loam and silty clay loam, and the lower 11 inches is firm light silty clay loam. The underlying material, to a depth of 75 inches, is gray stratified silt loam and silty clay loam. The soil material is mottled throughout the profile.

Available water capacity is moderate in Ginat soils, and permeability is very slow. The content of organic matter is low. These soils have a seasonal high water table.

Representative profile of Ginat silt loam in an urban area, 910 feet north and 160 feet east of the SW. corner of NW¼ sec. 35, T. 6 S., R. 10 W.:

Ap—0 to 9 inches, gray (10YR 6/1) silt loam; common, fine, distinct, strong-brown (7.5YR 5/6) mottles; weak, fine, granular structure; friable; medium acid; abrupt, smooth boundary.

A2g—9 to 17 inches, gray (10YR 6/1) silt loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak, very coarse, platy structure that parts to weak, medium, granular; common black (10YR 2/1) concretions; friable; strongly acid; clear, smooth boundary.

B2tg—17 to 23 inches, gray (10YR 6/1) heavy silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; friable; thin, patchy, gray (10YR 5/1) clay films on faces of peds; common fine mica flakes; common, small, black (10YR 2/1) concretions; very strongly acid; clear, wavy boundary.

Bx1g—23 to 37 inches, gray (10YR 6/1) light silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, very coarse, prismatic structure that parts to weak, medium, subangular blocky; firm and brittle; thin, patchy, gray (10YR 5/1) clay films on faces of peds; light-gray (10YR 7/1) silt coatings on vertical faces of peds and in cracks; common fine mica flakes; common black (10YR 2/1) concretions; very strongly acid; gradual, wavy boundary.

Bx2g—37 to 52 inches, gray (10YR 6/1) silty clay loam; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, very coarse, prismatic structure; very firm and brittle; thin, patchy, gray (10YR 5/1) clay films on faces of peds; light-gray (10YR 7/1) silt streaks; common fine mica flakes; common black (10YR 2/1) concretions; strongly acid; gradual, wavy boundary.

B3g—52 to 63 inches, gray (10YR 6/1) light silty clay loam; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak, coarse, subangular blocky structure; firm; light-gray (10YR 7/2) silt coatings in cracks and on faces of peds; common fine mica flakes; few black (10YR 2/1) concretions; strongly acid; gradual, wavy boundary.

Cg—63 to 75 inches, gray (10YR 6/1) stratified silt loam and silty clay loam; many, medium, distinct, yellowish-red (5YR 5/6) and reddish-yellow (7.5YR 6/8) mottles; massive; friable; common fine mica flakes; strongly acid.

The solum ranges from 50 to 70 inches in thickness. The Ap horizon ranges from gray (10YR 5/1) to light gray (10YR 6/1) in color. The A2 horizon is gray (10YR 6/1) or light gray (10YR 7/2). The B2tg and Bx1g horizons are heavy silt loam or silty clay loam. The Bx2g horizon ranges from silty clay loam to light clay loam. Depth to the fragipan ranges from 18 to 26 inches.

Ginat soils are associated with Weinbach and Sciotoville soils. They are grayer throughout the profile than these soils.

Ginat silt loam (0 to 2 percent slopes) (Gn).—Areas of this soil are long and narrow and 10 to 40 acres in size. They are in slight depressions along drainageways, adjacent to the better drained Weinbach and Sciotoville soils.

Included with this soil in mapping are small areas where the surface layer and subsoil are darker colored than those of this soil. Also included are small areas of somewhat poorly drained Weinbach soils.

Runoff is very slow on this soil. Wetness and the very slowly permeable fragipan are the major limitations in use and management (fig. 16).

If adequately drained, this soil is suited to corn, soybeans, small grain, hay, and pasture. It is not well suited to alfalfa and other deep-rooted crops, because the fragipan restricts downward root growth and movement of water.

This soil has a seasonal high water table and a very slowly permeable fragipan, both of which are severe limitations for most uses associated with town and country planning (fig. 17). Capability unit IIIw-12.

Gullied Land

Gullied land (Gu) consists of severely gullied soils on moderately sloping to steep uplands throughout the county. Areas are about 3 to 15 acres in size. They are associated with the Alford, Hosmer, Wellston, and Zanesville soils. This land is underlain by well-weathered sandstone and shale material. The gullies extend into the underlying material in many places.

The major hazards on this land are runoff and erosion. Most areas are no longer used for farming and have been abandoned (fig. 18). Weeds, grass, and trees grow in places. Some areas have been planted to trees. This land is suited to trees, grass, and shrubs. A protective cover of vegetation helps to stabilize the soil material, control runoff, and provide cover for wildlife. Capability unit VIIe-4.

Henshaw Series

The Henshaw series consists of deep, somewhat poorly drained, nearly level soils on terraces. These soils formed in

Figure 16.—Crops in Ginat silt loam that have drowned out as a result of excessive spring rains.

alluvium that eroded from loess. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is grayish-brown silt loam about 7 inches thick. The subsoil is light olive brown and is about 36 inches thick. The upper 5 inches is firm light silty clay loam, the next 24 inches is firm clay loam that has light brownish-gray mottles, and the lower 7 inches is firm light silty clay loam that has light brownish-gray mottles. The underlying material, to a depth of 60 inches, is mottled, light olive-brown, light brownish-gray, and dark yellowish-brown stratified silty clay loam and silt loam.

Available water capacity is high in Henshaw soils, and permeability is moderately slow. The content of organic matter is low. These soils have a seasonal high water table.

Representative profile of Henshaw silt loam in a golf course, 975 feet west and 300 feet north of the SE. corner of sec. 7, T. 6 S., R. 10 W.:

Ap—0 to 7 inches, grayish-brown (10YR 5/2) silt loam; weak, fine and medium, granular structure; friable, slightly acid; abrupt, smooth boundary.

B21t—7 to 12 inches, light olive-brown (2.5Y 5/4) light silty clay loam; moderate, medium, subangular blocky structure; firm, thin, discontinuous, grayish-brown (2.5Y 5/2) clay films on faces of peds; light-gray (10YR 7/1) silt coatings on peds and in old root channels; strongly acid; clear, smooth boundary.

B22t—12 to 28 inches, light olive-brown (2.5Y 5/4) silty clay loam; common, medium, distinct, light brownish-gray (2.5Y 6/2) mottles; moderate, medium, subangular blocky structure; firm; thin, discontinuous, light brownish-gray (10YR 6/2) clay films on faces of peds; thin, discontinuous, light-gray (10YR 5/1) silt coatings on faces of peds; common, fine, very dark brown (10YR 2/2) concretions; strongly acid; clear, smooth boundary.

Figure 17.—Maintaining streets on Ginat silt loam is difficult because of a seasonal high water table and high susceptibility to frost heave.

Figure 18.—**Gullied land that was formerly farmland but has been abandoned.**

B23t—28 to 36 inches, light olive-brown (2.5Y 5/6) heavy silty clay loam; common, medium, distinct light brownish-gray (2.5Y 6/2) mottles; weak, medium, prismatic structure that parts to moderate, medium, subangular blocky; firm; thin, discontinuous, light brownish-gray (10YR 6/2) clay films on faces of peds; common, fine, very dark brown (10YR 2/2) concretions; medium acid; gradual, smooth boundary.

B3t—36 to 43 inches, light olive-brown (2.5Y 5/4-5/6) light silty clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; distinct, light brownish-gray (10YR 6/2) mottles; weak, coarse, prismatic structure; firm; thin, patchy, light brownish-gray (10YR 6/2) clay films on faces of peds; few, fine, very dark brown (10YR 2/2) concretions; slightly acid; gradual, smooth boundary.

C—43 to 60 inches, light olive-brown (2.5Y 5/6), light brownish-gray (2.5Y 6/2), and dark yellowish-brown (10YR 4/4) stratified silty clay loam and silt loam; massive; firm; common lime concretions; moderately alkaline (calcareous).

The solum ranges from 34 to 60 inches in thickness. The Ap horizon ranges from dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2) or brown (10YR 5/3) in color. The B2 horizon is olive-brown (2.5Y 4/4) to light yellowish-brown (10YR 6/4) heavy silty clay loam or silty clay loam. It has few to many mottles of light brownish gray (2.5Y 6/2) to grayish brown (10YR 5/2). Depth to mottling ranges from 8 to 12 inches.

Henshaw soils are associated with and have drainage characteristics similar to those of McGary and Bartle soils. They contain less clay than McGary soils. Henshaw soils lack the fragipan of Bartle soils and are less acid.

Henshaw silt loam (0 to 2 percent slopes) (He).—This soil is mostly in large areas in broad lakebeds on terraces. Included in mapping are small areas of moderately eroded soils at the head of drainageways. Also included are some small areas of very poorly drained Patton soils.

Runoff is slow on this soil, and wetness is the major limitation in use and management. If a suitable drainage system is established and maintained, this soil is suited to corn, small grain, hay, and pasture.

Because of the moderately slow permeability and seasonal high water table, this soil has severe limitations for residential development unless public sewers are available. If public sewers are available, wetness is a moderate limitation for this use. Capability unit IIw-2.

Hosmer Series

The Hosmer series consists of deep, well-drained, nearly level to strongly sloping soils on uplands. These soils have a firm and brittle fragipan in the lower part of the subsoil. They formed in 4 to 8 feet of loess over sandstone and shale bedrock. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is brown silt loam about 7 inches thick. The subsoil is about 61 inches thick. The upper 5 inches is yellowish-brown, friable silt loam; the next 17 inches is strong-brown, firm light silty clay loam; and the lower 39 inches is a yellowish-brown and strong-brown, very firm and brittle, silt loam fragipan (fig. 19). The underlying material, to a depth of 73 inches, is yellowish-brown silt loam.

Available water capacity is moderate in Hosmer soils, and permeability is very slow. The content of organic matter is low.

Representative profile of Hosmer silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 1,310 feet east and 30 feet north of center of sec. 25, T. 4 S., R. 10 W.:

Ap—0 to 7 inches, brown (10YR 5/3) silt loam; weak, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

B1—7 to 12 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine and medium, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

B21t—12 to 20 inches, strong-brown (7.5YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; firm; thin, discontinuous, dark-brown (7.5YR 4/4) clay films on faces of peds; few pale-brown (10YR 6/3) silt coatings; strongly acid; clear, smooth boundary.

B22t—20 to 29 inches, strong-brown (7.5YR 4/6) light silty clay loam; weak, medium to coarse, prismatic structure that parts to moderate, medium, subangular blocky; firm; thin, continuous, dark-brown (7.5YR 5/4) clay films on faces of peds; thin brown (10YR 5/3) silt coatings on faces of peds and in cracks; very strongly acid; clear, wavy boundary.

A'2&B'x1—29 to 32 inches, yellowish-brown (10YR 5/6) silt loam; moderate, coarse, prismatic structure that parts to moderate, medium, subangular blocky; firm and brittle; the A'2 material consists of thin to thick, light brownish-gray (10YR 6/2) silt cappings on peds and fillings in krotovinas; very strongly acid; abrupt, irregular boundary.

B'x2—32 to 48 inches, strong-brown (7.5YR 5/6) heavy silt loam; moderate, very coarse, prismatic structure; very firm and brittle; thick, continuous, brown (7.5YR 5/4) clay films on faces of peds and linings in pores; light brownish-gray (10YR 6/2) silt coatings on faces of peds and in vertical cracks; very strongly acid; diffuse, irregular boundary.

B'x3—48 to 68 inches, yellowish-brown (10YR 5/6) and light yellowish-brown (10YR 6/4) silt loam; very coarse prismatic structure; very firm and brittle; discontinuous brown (7.5YR 5/4) clay films in vertical cracks; light brownish-gray (10YR 6/2) silt coatings in cracks; very strongly acid; gradual, irregular boundary.

***Figure 19.*—A weathered road cut on Hosmer soils exposing the light-gray, loess-capped prisms of the fragipan.**

C—68 to 73 inches, yellowish-brown (10YR 5/4) silt loam; massive; friable; light brownish-gray (10YR 6/2) silt coatings along vertical cracks; very strongly acid.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2) or brown (10YR 5/3) in color. The Bt horizon, above the fragipan, ranges from brown to strong-brown or yellowish-brown silty clay loam to heavy silt loam. The B'x horizon is 30 to 50 inches thick. It is silt loam or light silty clay loam. Reaction in the C horizon ranges from strongly acid to medium acid.

Hosmer soils are associated with Alford, Wellston, and Zanesville soils. They are more deeply leached than Alford soils and have a fragipan which Alford and Wellston soils do not have. Hosmer soils, unlike Zanesville soils, lack sandstone fragments in the lower part of the solum.

Hosmer silt loam, 0 to 2 percent slopes (HoA).—This soil is in long, narrow areas, 3 to 10 acres in size, on ridgetops. It has a profile similar to that described as representative of the series, but it has a thicker surface layer, and depth to the fragipan is about 32 inches.

Included with this soil in mapping are small areas where slopes are more than 2 percent.

Runoff is slow on this soil. The very slowly permeable fragipan and the moderate available water capacity are limitations in use and management. This soil is suited to most crops commonly grown in the county. It is not well suited to alfalfa and other deep-rooted crops, because the fragipan restricts downward root growth and movement of water. In years of below-average rainfall or poor rainfall distribution, crops are damaged by drought.

Because of the very slow permeability, this soil has severe limitations for residential development unless public sewers are available. If public sewers are available, limitations for this use are slight. Capability unit IIw-5.

Hosmer silt loam, 2 to 6 percent slopes, eroded (HoB2).—This soil is on ridgetops and side slopes. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of nearly level or moderately sloping soils. Also included are small areas of severely eroded soils that have a surface layer of mostly yellowish-brown material that was formerly the upper part of the subsoil.

Runoff is medium on this soil. The hazard of further erosion, the very slowly permeable fragipan, and the moderate available water capacity limit use. This soil is suited to most crops commonly grown in the county. It is not well suited to alfalfa and other deep-rooted crops, because the fragipan restricts downward root growth and movement of water. In years of below-average rainfall or poor rainfall distribution, crops are damaged by drought.

Because of the very slowly permeable fragipan, this soil has severe limitations for residential development unless sewers are available. If public sewers are available, limitations for this use are slight. Capability unit IIe-7.

Hosmer silt loam, 2 to 6 percent slopes, severely eroded (HoB3).—This soil is on ridgetops and sides of natural draws. The areas range from 3 to 8 acres in size. The profile is similar to that described as representative of the series, but erosion has removed 6 inches to all of the original surface layer. The present surface layer is mostly yellowish-brown subsoil material.

Included with this soil in mapping are a few small areas of moderately eroded soils. Also included are small areas where the slope is more than 6 percent.

Runoff is rapid on this soil. The hazard of further erosion, the very slowly permeable fragipan, and the moderate available moisture capacity limit use. This soil is suited to most crops commonly grown in the county. It is not well suited to alfalfa and other deep-rooted crops, because the fragipan restricts downward root growth and movement of water. In years of below-average rainfall or poor rainfall distribution, crops are damaged by drought. Seedbed preparation is more difficult on this soil than on the moderately eroded soils.

Because of the very slowly permeable fragipan, this soil has severe limitations for residential development unless public sewers are available. If public sewers are available, limitations for this use are slight. Capability unit IIIe-7.

Hosmer silt loam, 6 to 12 percent slopes, eroded (HoC2).—This soil is on sides of natural draws and on uniform side slopes below ridgetops. The areas are 5 to 15 acres in size. This soil has a thinner surface layer and subsoil than those in the soil described as representative of the series.

Included with this soil in mapping are small areas of severely eroded soils and a few areas where the slope is more than 12 percent.

Runoff is medium on this soil. The hazard of further erosion, the very slowly permeable fragipan (fig. 20), and the

moderate available water capacity limit use. This soil is suited to most crops commonly grown in the county. It is not well suited to alfalfa and other deep-rooted crops, because the fragipan restricts downward root growth and movement of water. In years of below-average rainfall or poor rainfall distribution, crops are damaged by drought.

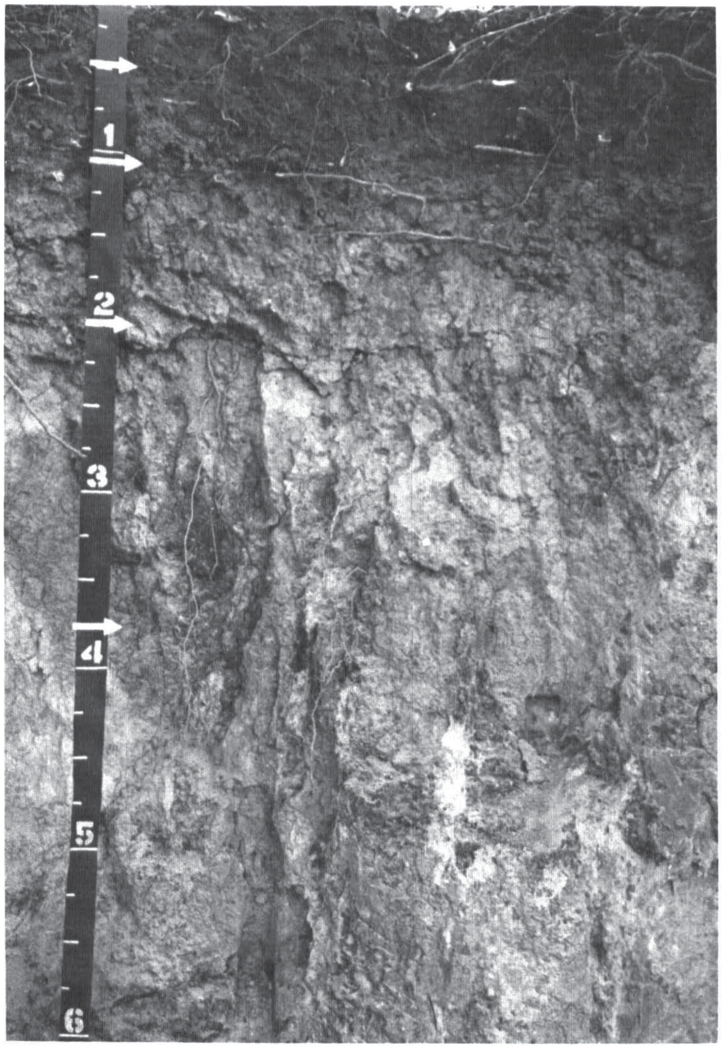

Figure 20.—A profile of Hosmer silt loam with a very slowly permeable fragipan layer beginning at approximately 2 feet. Tree roots penetrate only the vertical cracks.

Because of the very slowly permeable fragipan, this soil has severe limitations for residential development unless public sewers are available. If public sewers are available, limitations for this use are moderate because of the need for cuts and fills and erosion control during construction. Capability unit IIIe-7.

Hosmer silt loam, 6 to 12 percent slopes, severely eroded (HoC3).—This soil is on sides of natural draws where slopes are short and on uniform long sides of ridges. It has a profile similar to that described as representative of the series, but the depth to the fragipan ranges from 20 to 24 inches and the surface layer is mostly yellowish-brown subsoil material.

Included in this soil in mapping are small areas of moderately eroded soils.

Runoff is rapid on this soil. The hazard of further erosion, the very slowly permeable fragipan, and the moderate available water capacity limit use. This soil is suited to small grain, hay, and pasture. It is not well suited to alfalfa and other deep-rooted crops, because the fragipan restricts downward root growth. The severe hazard of further erosion limits the use of this soil for row crops. In years of below-average rainfall or poor rainfall distribution, crops are damaged by drought. Seedbeds often are cloddy, which results in poorer crop stands.

Because of the very slowly permeable fragipan, this soil has severe limitations for residential development unless public sewers are available. If public sewers are available, limitations for this use are moderate because of the need for cuts and fills and erosion control during construction. Capability unit IVe-7.

Hosmer silt loam, 12 to 18 percent slopes, severely eroded (HoD3).—This soil is on sides of natural draws and on side slopes below ridgetops. It has a profile similar to that described as representative of the series, but 6 inches to all of the original surface layer of this soil has been removed by erosion, and the present surface layer is mostly strong-brown subsoil material. Also, because of the reduced depth to the fragipan, the available water capacity of this soil is lower.

Included with this soil in mapping are small areas where the soil is only moderately eroded. Also included, in places, are small areas where gullies expose the fragipan.

Runoff is very rapid on this soil. The hazard of further erosion, the very slowly permeable fragipan, and the moderate available water capacity limit use. This soil is suited to hay and pasture. It is not well suited to alfalfa and other deep-rooted crops because the fragipan restricts downward root growth and movement of water. In years of below-average rainfall or poor rainfall distribution, crops are damaged by drought. The severe hazard of further erosion limits the use of this soil for row crops. Seedbeds generally are cloddy.

Because of the very slowly permeable fragipan, slope, and very rapid runoff, this soil has severe limitations for residential development. Capability unit VIe-1.

Huntington Series

The Huntington series consists of deep, well-drained, nearly level soils on bottom lands. These soils formed in mixed alluvium derived from sediment of the Ohio River. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is dark-brown silty clay loam about 10 inches thick. The subsoil is about 33 inches thick. The upper 10 inches is dark-brown, firm light silty clay loam; the next 13 inches is dark yellowish-brown, firm light silty clay loam; and the lower 10 inches is dark yellowish-brown, friable heavy silt loam. The underlying material, to a depth of 62 inches, is dark yellowish-brown stratified silt loam that has thin layers of very fine sandy loam.

Available water capacity is high in Huntington soils, and permeability is moderate. The content of organic matter is moderate.

Representative profile of Huntington silty clay loam in a cultivated field, 810 feet south and 10 feet east of the center of sec. 9, T. 7 S., R. 10 W.:

Ap—0 to 10 inches, dark-brown (10YR 3/3) silty clay loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

B21—10 to 20 inches, dark-brown (10YR 3/3) light silty clay loam; moderate, medium, subangular blocky structure; firm; neutral; few fine mica flakes; wavy boundary.
B22—20 to 33 inches, dark yellowish-brown (10YR 3/4) light silty clay loam; weak, medium, subangular blocky structure; firm; few fine mica flakes; neutral; gradual, wavy boundary.
B23—33 to 43 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; weak, coarse, subangular blocky structure; friable; thin, patchy, dark grayish-brown (10YR 4/2) coatings on faces of peds and in root channels; few fine mica flakes; neutral; gradual, wavy boundary.
C—43 to 62 inches, dark yellowish-brown (10YR 4/4) stratified silt loam that has thin lenses of very fine sandy loam; massive; friable; few fine mica flakes; neutral.

The solum ranges from 35 to 52 inches in thickness. The Ap horizon is very dark grayish brown (10YR 3/2) or dark brown (10YR 3/3) in color. The B2 horizon ranges from dark yellowish-brown (10YR 3/4) to dark brown (7.5YR 4/4). Reaction ranges from slightly acid to mildly alkaline throughout the profile.

Huntington soils are associated with Lindside and Newark soils. They are better drained than Lindside and Newark soils.

Huntington silty clay loam (0 to 2 percent slopes) (Ht).—This soil is on broad bottom lands. Included in mapping are small areas adjacent to the Ohio River that have a loam surface layer and a silt loam or heavy silt loam subsoil. Also included are small areas of 1 acre or less that have 8 to 14 inches of fine sandy loam overwash. These areas are indicated on the map by sand spot symbols.

Runoff is slow on this soil, and flooding is the major hazard in use and management (fig. 21). This soil is suited to corn, soybeans, grain, sorghum, and hay. Alfalfa and small grain are subject to flood damage early in spring.

Because of the annual flood hazard, this soil has severe limitations for residential development. Capability unit I-2.

Huntington Series, Sandy Variant

The Huntington series, sandy variant, consists of deep, well-drained, nearly level soils on bottom lands. These soils formed in loamy alluvium. The native vegetation is mixed hardwood trees.

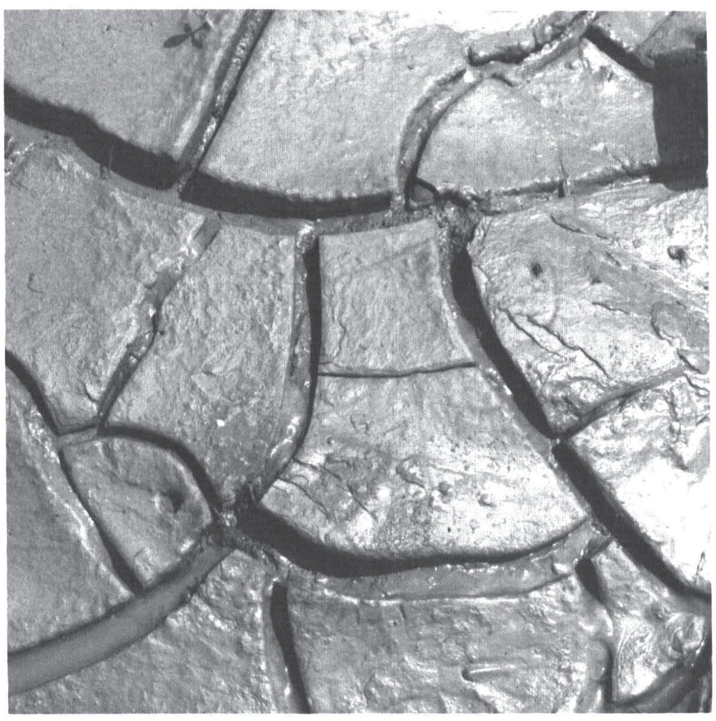

Figure 21.—The aftermath of a recent flood left sediment that cracks readily when drying out.

In a representative profile the surface layer is dark-brown fine sandy loam about 10 inches thick. The subsoil is brown and dark yellowish-brown, friable fine sandy loam about 30 inches thick. The underlying material, to a depth of 70 inches, is dark yellowish-brown, stratified silt loam, light silty clay loam, and fine sandy loam.

Available water capacity is high in these soils, and permeability is moderately rapid. The content of organic matter is moderate.

Representative profile of Huntington fine sandy loam, sandy variant, in a cultivated field, 20 feet east and 10 feet north of the center of the SW¼ sec. 12, T. 7 S., R. 10 W.:

Ap—0 to 10 inches, dark-brown (10YR 3/3) fine sandy loam; weak, medium, granular structure; very friable; common fine mica flakes; neutral; abrupt, smooth boundary.
B21—10 to 21 inches, brown (10YR 4/3) fine sandy loam; weak, medium, subangular blocky structure; friable; common fine mica flakes; neutral; clear, wavy boundary.
B22—21 to 40 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, medium, subangular blocky structure; friable; common fine mica flakes; neutral; clear, wavy boundary.
C—40 to 70 inches, dark yellowish-brown (10YR 3/4) stratified silt loam, light silty clay loam, and fine sandy loam; friable; common fine mica flakes; neutral.

The Ap horizon is very dark grayish brown (10YR 3/2) or dark brown (10YR 3/3) in color. The B2 horizon ranges from brown (10YR 4/3) to yellowish brown (10YR 5/4) or dark brown (7.5YR 4/4). It is slightly acid to mildly alkaline. The C horizon ranges from stratified silt loam, light silty clay loam, and fine sandy loam to stratified fine sandy loam and loamy sand.

Huntington series, sandy variant, soils are associated with Huntington and Lindside soils. They are more sandy throughout the profile than these soils, and, unlike Lindside soils, they are well drained.

Huntington fine sandy loam, sandy variant (0 to 2 percent slopes) (Hu).—This soil is on bottom lands adjacent to stream channels. Included in mapping are small areas that have 8 to 12 inches of loamy sand overwash. These areas are shown on the map by a sand spot symbol.

Runoff is slow on this soil, and flooding is the major hazard in use and management. This soil is suited to corn, soybeans, grain, sorghum, and hay. Alfalfa and small grain are subject to flood damage early in spring.

Because of the annual flood hazard, this soil has severe limitations for residential development. Capability unit I-2.

Iona Series

The Iona series consists of deep, moderately well drained, nearly level and gently sloping soils on uplands. These soils formed in more than 6 feet of loess. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is dark grayish-brown silt loam about 8 inches thick. The subsoil is about 34 inches thick. The upper 25 inches is mottled, yellowish-brown, firm silty clay loam, and the lower 9 inches is mottled, yellowish-brown, friable silt loam. The underlying material, to a depth of 60 inches, is pale-brown and light yellowish-brown silt loam.

Available water capacity is high in Iona soils, and permeability is moderately slow. These soils have a seasonal high water table. The content of organic matter is moderate.

Representative profile of Iona silt loam, 0 to 2 percent slopes, in a cultivated field, 350 feet north and 400 feet east of the center of sec. 5, T. 5 S., R. 11 W.:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

B1t—8 to 11 inches, brown (10YR 5/3) light silty clay loam; few, fine, faint, yellowish-brown (10YR 5/6) mottles; moderate, fine, subangular blocky structure; friable; thin, patchy, light brownish-gray (10YR 6/2) silt coatings on faces of peds and in cracks; medium acid; clear, smooth boundary.

B21t—11 to 18 inches, yellowish-brown (10YR 5/4) silty clay loam; common, medium, faint, pale-brown (10YR 6/3) mottles; moderate, medium, angular and subangular blocky structure; firm; few, thin, discontinuous, brown (10YR 4/3) clay films on most peds; medium acid; clear, smooth boundary.

B22t—18 to 33 inches, yellowish-brown (10YR 5/4) silty clay loam; common, medium, distinct, brownish-yellow (10YR 6/8) and grayish-brown (10YR 5/2) mottles; moderate, medium and coarse, subangular blocky structure; firm; thin, continuous, dark grayish-brown (10YR 4/2) clay films on most peds; light-gray (10YR 7/2) silt streaks and coatings in vertical cracks; few very dark brown (10YR 2/2) iron and manganese concretions; medium acid in upper part, grades to slightly acid in lower part; gradual, wavy boundary.

B3—33 to 42 inches, yellowish-brown (10YR 5/6) silt loam; common, medium, distinct, brownish-yellow (10YR 6/6) and grayish-brown (10YR 5/2) mottles; weak, coarse and very coarse, subangular blocky structure; friable; thin, discontinuous, clay films on faces of peds; neutral; clear, wavy boundary.

C—42 to 60 inches, pale-brown (10YR 6/3) and light yellowish-brown (10YR 6/4) silt loam; massive; friable; light brownish-gray (10YR 6/2) silt coatings and streaks; moderately alkaline (calcareous).

The solum ranges from about 36 to 44 inches in thickness. The Ap horizon ranges from dark grayish brown (10YR 4/2) to dark yellowish brown (10YR 4/4) or brown (10YR 5/3) in color. An A2 horizon, 3 to 6 inches thick, is present in places. The B2 horizon is pale-brown (10YR 6/3) to yellowish-brown (10YR 5/4) heavy silt loam or silty clay loam that is mottled with shades of gray below the top 10 inches of the B horizon. Reaction of the C horizon ranges from neutral to moderately alkaline (calcareous).

Iona soils are associated with Muren, Ragsdale, and Reesville soils. They are similar to the Muren soils in natural drainage. The Iona soils are less acid in the C horizon than Muren soils. They are better drained than Ragsdale and Reesville soils.

Iona silt loam, 0 to 2 percent slopes (IoA)—This soil is on low ridges and toe slopes. It has the profile described as representative of the series. Included in mapping are small areas of gently sloping soils at the head of drainageways.

Runoff is slow on this soil. This soil has no serious limitations for farming. It is suited to all crops commonly grown in the county.

Because of its moderately slow permeability, this soil has severe limitations for residential development unless public sewers are available. It has moderate limitations for this use if public sewers are available. Capability unit I-1.

Iona silt loam, 2 to 6 percent slopes, eroded (IoB2).—This soil is on side slopes next to drainageways, on toe slopes at the base of more steeply sloping soils, and on long side slopes and ridgetops. It has a profile similar to that described as representative of the series, but erosion has removed 2 to 5 inches of the original surface layer. The present surface layer consists mostly of the remaining original surface layer and a moderate amount of brown subsoil material. Included in mapping are a few small areas of severely eroded soils near drainageways.

Runoff is medium on this soil, and erosion is the major hazard in use and management. This soil is well suited to all crops commonly grown in the county.

Because of moderately slow permeability this soil has severe limitations for residential development unless public sewers are available. It has moderate limitations for this use if public sewers are available. Capability unit IIe-3.

Iva Series

The Iva series consists of deep, somewhat poorly drained, nearly level soils on uplands. These soils formed in more than 6 feet of loess. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is grayish-brown silt loam about 9 inches thick. The subsurface layer is light brownish-gray silt loam about 3 inches thick. The subsoil is about 42 inches thick. The upper 5 inches is mottled, light brownish-gray friable silt loam; the next 20 inches is mottled, yellowish-brown and brown, firm silty clay loam; and the lower 17 inches is light brownish-gray and brownish-yellow, friable silt loam. The underlying material, to a depth of 60 inches, is light brownish-gray and brownish-yellow silt loam.

Available water capacity is high in Iva soils, and permeability is slow. The content of organic matter is low. These soils have a seasonal high water table.

Representative profile of Iva silt loam in cultivated field, 1,155 feet east and 75 feet south of the NW. corner of SW¼ sec. 21, T. 4 S., R. 10 W.:

Ap—0 to 9 inches, grayish-brown (10YR 5/2) silt loam; weak, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—9 to 12 inches, light brownish-gray (10YR 6/2) silt loam; common, medium, distinct, pale-brown (10YR 6/3) mottles; moderate, medium, platy structure; friable; strongly acid; clear, smooth boundary.

B1g—12 to 17 inches, light brownish-gray (10YR 6/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/4) mottles; weak, medium, subangular blocky structure; friable; thin light-gray (10YR 7/2) silt coatings on most peds; very strongly acid; clear, smooth boundary.

B21tg—17 to 28 inches, yellowish-brown (10YR 5/4) silty clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; moderate, medium, subangular blocky structure; firm; thin gray (10YR 6/1) clay films and light-gray (10YR 7/1) silt coatings on faces of peds; medium acid; clear, smooth boundary.

B22tg—28 to 37 inches, brown (10YR 5/3) and yellowish-brown (10YR 5/6) silty clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, coarse, prismatic structure that parts to moderate, coarse, subangular blocky; firm; thin, continuous, light brownish-gray (10YR 6/2) and light yellowish-brown (10YR 6/4) clay films and light-gray (10YR 7/1) silt coatings on most peds; strongly acid; clear, smooth boundary.

B3g—37 to 54 inches, light brownish-gray (10YR 6/2) and brownish-yellow (10YR 6/8) silt loam; weak, coarse, subangular blocky structure; friable; thin, patchy, grayish-brown (10YR 5/2) clay films on most peds; few black (10YR 2/1) concretions; medium acid; gradual, smooth boundary.

C—54 to 60 inches, light brownish-gray (10YR 6/2) and brownish-yellow (10YR 6/8) silt loam; massive; friable; slightly acid.

The solum ranges from 48 to 60 inches in thickness. The Ap horizon ranges from dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2) in color. The B2 horizon is light silty clay loam to silty clay loam and is strongly acid to medium acid. Depth to mottling ranges from 6 to 12 inches. The C horizon is medium acid to slightly acid.

Iva soils are associated with Reesville soils and have similar drainage characteristics. They are more acid and have a thicker solum than Reesville soils.

Iva silt loam (0 to 2 percent slopes) (Iv).—This soil is on broad flats on uplands. Included in mapping are small gently sloping areas around drainageways.

Runoff is slow on this soil, and wetness is the major limitation in use and management. If a suitable drainage system is established and maintained, this soil is suited to all crops commonly grown in the county.

Because of its slow permeability and the seasonal high water table, this soil has severe limitations for residential development unless public sewers are available. It has moderate limitations for this use if public sewers are available. Capability unit IIw-2.

Lindside Series

The Lindside series consists of deep, moderately well drained, nearly level soils on bottom lands. These soils formed in mixed alluvium derived from Ohio River sediment. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is dark-brown silty clay loam about 10 inches thick. The subsoil is about 30 inches thick. It is firm, dark-brown light silty clay loam in the upper 10 inches and friable, dark-brown silt loam mottled with light brownish gray in the lower 20 inches. The underlying material, to a depth of 60 inches, is brown stratified silt loam and light silty clay loam. Thin lenses of fine sand are in this material.

Available water capacity is high in Lindside soils, and permeability is moderate. These soils have a seasonal high water table. The content of organic matter is moderate.

Representative profile of Lindside silty clay loam in a cultivated field, 20 feet west and 20 feet south of the NE. corner of sec. 3, T. 7 S., R. 11 W.:

Ap—0 to 10 inches, dark-brown (10YR 4/3) silty clay loam; weak, fine, granular structure; friable; few mica flakes; neutral; abrupt, smooth boundary.

B21—10 to 20 inches, dark-brown (10YR 4/3) light silty clay loam; weak, fine, subangular blocky structure; firm; few mica flakes; neutral; clear, wavy boundary.

B22—20 to 40 inches, dark-brown (10YR 4/3) silt loam; many, fine, distinct, light brownish-gray (10YR 6/2) mottles; weak, fine and medium, subangular blocky structure; friable; few mica flakes; neutral; gradual, wavy boundary.

C—40 to 60 inches, brown (10YR 4/3-5/3) stratified silt loam and light silty clay loam that contains thin lenses of fine sand; common, fine, distinct, light brownish-gray mottles; friable; neutral.

The solum ranges from 30 to 60 inches in thickness. The Ap horizon ranges from dark brown (10YR 3/3) to very dark grayish brown (10YR 3/2) or brown (10YR 4/3) in color. The B horizon has hues of 10YR to 7.5YR, a value of 4 or 5, and a chroma of 3 or 4. Depth to low-chroma mottling ranges from 15 to 24 inches. The B horizon is silt loam to light silty clay loam, but in places a thin stratum of fine sand is present.

Lindside soils are associated with, and have the same texture as, Huntington and Newark soils. Unlike Huntington soils they have mottles in the lower part of the B horizon. Lindside soils are better drained than Newark soils.

Lindside silty clay loam (0 to 2 percent slopes) (Ln).—This soil is in long, narrow bands on broad bottom lands that are adjacent to Huntington soils and in slightly lower positions. Included in mapping are small areas of somewhat poorly drained Newark soils adjacent to drainage channels. Also included are areas where the surface layer is silt loam.

Runoff is slow on this soil, and flooding is the major hazard in use and management. Corn, soybeans, grain, sorghum, and hay are the main crops. Small grain and alfalfa are subject to serious flood damage early in spring.

Because of the annual flood hazard, this soil has severe limitations for residential development. Capability unit I-2.

Made Land

Made land (Ma) consists of areas that were originally borrow areas and deep depressions that have been filled with cinders, solid waste, soil material or other rubble and then leveled. Included in mapping are areas that have been used for sanitary landfills. These areas have been leveled and covered with soil material. Also included are areas that have been covered with various types of rubble from demolished buildings.

Runoff and erosion are hazards on Made land, and establishing a vegetative cover is a problem in some areas. Capability unit VIIe-3.

Markland Series

The Markland series consists of deep, well-drained, gently sloping to strongly sloping soils on terraces. These soils formed in thin loess and the underlying silty clay, silty clay loam, and silt loam lacustrine sediment. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is dark grayish-brown and brown silt loam about 6 inches thick. The subsoil is about 22 inches thick. The upper 4 inches is yellowish-brown, firm light silty clay loam, and the lower 18 inches is brown, very firm silty clay. The underlying material, to a depth of 60 inches, is dark yellowish-brown stratified silty clay, silty clay loam, and silt loam.

Available water capacity is high in Markland soils, and permeability is slow. The content of organic matter is moderate.

Representative profile of Markland silt loam, 6 to 18 percent slopes, eroded, in a cultivated field, 530 feet east and 1,050 feet south of the NW. corner of the NE¼ sec. 18, T. 6 S., R. 10 W.:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) and brown (10YR 5/3) silt loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

Blt—6 to 10 inches, yellowish-brown (10YR 5/4) light silty clay loam; moderate, medium, subangular blocky structure; firm; few, thin, discontinuous, dark-brown (10YR 4/3) clay films on faces of peds; medium acid; clear, smooth boundary.

IIB21t—10 to 21 inches, brown (10YR 4/3) silty clay; strong, medium, angular and subangular blocky structure; very firm; thin, continuous, dark yellowish-brown (10YR 4/4) clay films on faces of peds; medium acid; clear, smooth boundary.

IIB22t—21 to 28 inches, brown (10YR 4/3) silty clay; strong, medium and coarse, subangular blocky structure; very firm; thin dark yellowish-brown (10YR 4/4) clay films on faces of peds; pale-brown (10YR 6/3) silt coatings on faces of most peds; medium acid; clear, wavy boundary.

IIC—28 to 60 inches, dark yellowish-brown (10YR 4/4) stratified silty clay and silty clay loam that has a few layers of silt loam 1 to 3 inches thick; common, medium, distinct, gray (10YR 6/1) and yellowish-brown (10YR 5/6) mottles; firm; massive; moderately alkaline (calcareous).

The solum ranges from 24 to 42 inches in thickness. The Ap horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3) or yellowish brown (10YR 5/4) in color. An A2 horizon 3 to 5 inches thick is present in places. The B2 horizon ranges from heavy silty clay loam to clay. A loess cap, 3 to 14 inches thick, is in the upper part of the profile.

Markland soils are associated with McGary and Zipp soils, but they are better drained than these soils. They have drainage characteristics similar to those of Uniontown soils. The B horizon in Markland soils contains more clay than the B horizon in Uniontown soils.

Markland silt loam, 2 to 6 percent slopes, eroded (MkB2).—This soil is on short side slopes and heads of natural drainageways adjacent to nearly level, somewhat poorly drained McGary soils. It has a profile similar to that described as representative of the series, but it has a thicker surface layer and subsoil.

Included with this soil in mapping are small areas adjacent to drainageways where the soil is severely eroded. In these areas the surface layer is mostly light yellowish-brown light silty clay.

Runoff is medium on this soil, and the hazard of erosion is a major limitation in use and management. This soil is suited to corn, soybeans, small grain, hay, and pasture plants.

Because of the clayey subsoil and slow permeability, this soil has severe limitations for residential development unless public sewers are available. If public sewers are available, limitations for this use are moderate. Capability unit IIIe-11.

Markland silt loam, 6 to 18 percent slopes, eroded (MkC2).—This soil is on the sides of drainageways and on

short breaks adjacent to the nearly level, somewhat poorly drained McGary soils. It has the profile described as representative of the series. Included in mapping are small areas of severely eroded soils that generally have a surface layer of yellowish-brown silty clay loam.

Runoff is medium or rapid on this soil, and erosion is the major hazard in use and management. This soil is suited to most crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops. Careful management is required to control erosion in cultivated fields.

In areas where slope is more than 12 percent, this soil has severe limitations for residential development, even if public sewers are available. In areas where slope is less than 12 percent, it has a moderate limitation for this use if public sewers are available and, because of slow permeability, a severe limitation without public sewers. Capability unit IVe-11.

Markland silty clay loam, 6 to 18 percent slopes, severely eroded (MlC3).—This soil is on the sides of drainageways and on short breaks adjacent to the nearly level, somewhat poorly drained McGary and Henshaw soils (fig. 22). It has a profile similar to that described as representative of the series, but erosion has removed most or all of the original surface layer of this soil. The present surface layer is mostly yellowish-brown silty clay loam. In some small areas calcareous silty clay material is exposed on the surface (fig. 23).

Figure 22.—**A typical landscape of Markland silty clay loam on breaks and short slopes adjacent to drainageways.**

Runoff is rapid on this soil, and erosion is the major hazard in use and management. This soil is better suited to hay crops or to permanent pasture than to most other uses.

Because of slow permeability, this soil has severe limitations for residential development in areas where public sewers are not available. In areas where the slope is more than 12 percent, slope and the need for cuts and fills create severe limitations for residential development, even if public sewers are available. In areas where the slope is less than 12 percent, limitations for this use are moderate if public sewers are available. Capability unit VIe-1.

McGary Series

The McGary series consists of deep, somewhat poorly drained, nearly level soils on terraces. These soils formed in a thin layer of loess and the underlying silty clay and silty clay loam lacustrine sediment. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is grayish-brown silt loam about 6 inches thick. The subsurface layer is about 4 inches of mottled, light brownish-gray silt loam. The subsoil is about 32 inches thick. The upper 6 inches is mottled, brown, firm heavy silty clay loam, and the lower 26 inches is mottled, grayish-brown, firm silty clay. The underlying material, to a depth of 60 inches, is grayish-brown, yellowish-brown, and gray stratified silty clay and silty clay loam.

Available water capacity is moderate in McGary soils, and permeability is slow. These soils have a seasonal high water table. The content of organic matter is low.

Representative profile of McGary silt loam in a cultivated field, 1,300 feet east and 990 feet north of the SW. corner of sec. 4, T. 6 S., R. 10 W.:

Ap—0 to 6 inches, grayish-brown (10YR 5/2) silt loam; weak, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

A2—6 to 10 inches, light brownish-gray (10YR 6/2) silt loam; common, fine, faint, pale-brown (10YR 6/3) mottles; weak, coarse, platy structure that parts to weak, medium, granular; friable; medium acid; clear, smooth boundary.

IIB21t—10 to 16 inches, brown (10YR 5/3) heavy silty clay loam; many, medium, distinct, grayish-brown (10YR 5/2) mottles; moderate, medium, angular blocky structure; firm; thin, discontinuous, gray (10YR 6/1) clay films on faces of peds; medium acid; clear, wavy boundary.

IIB22tg—16 to 30 inches, grayish-brown (10YR 5/2) silty clay; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, prismatic structure that parts to moderate, medium, angular blocky; firm; thin, continuous, gray (10YR 6/1) clay films on faces of peds; slightly acid; clear, wavy boundary.

IIB23tg—30 to 42 inches, grayish-brown (2.5Y 5/2) silty clay; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, coarse, angular blocky structure; firm; thin, discontinuous, gray (5Y 6/1) clay films on faces of peds; neutral; clear, wavy boundary.

IIC—42 to 60 inches, grayish-brown (2.5Y 5/2), yellowish-brown (10YR 5/4), and gray (10YR 6/1) stratified silty clay and silty clay loam; weak, very coarse, blocky structure; firm; mildly alkaline (calcareous).

The Ap horizon ranges from gray (10YR 5/1) to grayish brown (10YR 5/2) in color. In places the former A2 horizon has been mixed into the Ap horizon. The C horizon contains thin strata of silt in places.

McGary soils are associated with Zipp and Henshaw soils. They are browner throughout their profile than Zipp soils. McGary soils have drainage characteristics similar to those of Henshaw soils, but they contain more clay.

Figure 23.—**Exposed calcareous silty clay at the surface provides a poor medium for plant growth.**

McGary silt loam (0 to 2 percent slopes) (Mr).—This soil is mostly in narrow areas on lakebed terraces near breaks adjacent to the darker colored Zipp and Patton soils. Included in mapping are small areas at the head of drainageways where the slope is more than 2 percent. Also included in a few places near drainageways are areas where the brown subsoil material is exposed.

Runoff is slow on this soil. Wetness and the slowly permeable subsoil are the major limitations in use and management. If adequate drainage is established and maintained, this soil is suited to corn, soybeans, small grain, hay, and pasture.

Because of wetness and a slowly permeable subsoil, this soil has severe limitations for residential development unless

public sewers are available. If public sewers are available, limitations for this use are moderate. Capability unit IIIw-6.

Muren Series

The Muren series consists of deep, moderately well drained, nearly level and gently sloping soils on uplands. These soils formed in more than 5 feet of loess. The native vegetation is hardwood trees.

In a representative profile the surface layer is dark yellowish-brown silt loam about 7 inches thick. The subsurface layer is yellowish-brown silt loam about 3 inches thick. The subsoil is about 40 inches thick. The upper 7 inches is firm, mottled, dark yellowish-brown and yellowish-brown light silty clay loam; the next 17 inches is firm, yellowish-brown silty clay loam; and the lower 16 inches is friable, mottled, yellowish-brown heavy silt loam. The underlying material, to a depth of 60 inches, is yellowish-brown silt loam.

Available water capacity is high in Muren soils, and permeability is moderately slow. These soils have a seasonal high water table. The content of organic matter is low.

Representative profile of Muren silt loam, 2 to 6 percent slopes, eroded, 200 feet west and 40 feet south of the NE. corner sec. 5, T. 5 S., R. 11 W.:

Ap—0 to 7 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—7 to 10 inches, yellowish-brown (10YR 5/4) silt loam; moderate, medium, platy structure that parts to weak, fine, subangular blocky; friable; few thin, light-gray (10YR 7/2) silt coatings on faces of most peds; medium acid; clear, smooth boundary.

B21t—10 to 17 inches, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/4) light silty clay loam; few, fine, distinct, light brownish-gray (10YR 6/2) mottles; moderate, fine and medium, subangular blocky structure; firm; thin, discontinuous, brown (10YR 5/3) clay films and thin, patchy, light-gray (10YR 7/2) silt coatings on faces of peds; strongly acid; clear, smooth boundary.

B22t—17 to 34 inches, yellowish-brown (10YR 5/4) silty clay loam; common, medium, distinct, gray (10YR 6/1) and light brownish-gray (10YR 6/2) mottles; weak, medium, prismatic structure that parts to moderate, medium, subangular blocky; firm; light-gray (10YR 7/1) silt coatings; thin, discontinuous, dark yellowish-brown (10YR 4/4) clay films on faces of peds; strongly acid; clear, smooth boundary.

B3—34 to 50 inches, yellowish-brown (10YR 5/4) heavy silt loam; common, medium, distinct, light brownish-gray (10YR 6/2) and brown (10YR 5/3) mottles; weak, coarse, prismatic structure that parts to weak, coarse, subangular blocky; friable; light-gray (10YR 7/1) silt streaks and thin, discontinuous, gray (10YR 6/1) clay films on most peds and in vertical cracks; strongly acid; gradual, smooth boundary.

C—50 to 60 inches, yellowish-brown (10YR 5/4) silt loam; light brownish-gray (10YR 6/2) streaks and discontinuous films; massive; friable; few very dark brown (10YR 2/2) concretions; slightly acid.

The solum ranges from about 44 to 60 inches in thickness. The Ap horizon ranges from dark grayish brown (10YR 4/2) to dark yellowish brown (10YR 4/4) or yellowish brown (10YR 5/4) in color. The B2 horizon is dark yellowish-brown (10YR 4/4) to light yellowish-brown (10YR 6/4) heavy silt loam to silty clay loam that is mottled with shades of gray at a depth of 10 to 20 inches. In the C horizon reaction is medium acid or slightly acid.

Muren soils are associated with Alford, Hosmer, and Iva soils. They are not so well drained as Alford soils. Muren soils lack the fragipan of Hosmer soils and are less acid. They are better drained than Iva soils.

Muren silt loam, 0 to 2 percent slopes (MuA).—This soil is on narrow ridgetops and in small areas at the toe of slopes. It has a profile similar to that described as representative of the series, but the surface layer of this soil is thicker and darker colored.

Included with this soil in mapping are small areas of nearly level Alford soils. Also included are small areas of soil that has a weakly developed fragipan.

Runoff is slow on this soil, and control of erosion is not a major concern. The soil is suited to all crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops.

Because of moderately slow permeability, this soil has severe limitations for residential development unless public sewers are available. If public sewers are available, limitations for this use are moderate. Capability unit I-1.

Muren silt loam, 2 to 6 percent slopes, eroded (MuB2).—This soil is on ridgetops, side slopes, and toe slopes at the base of more steeply sloping soils. It has the profile described as representative of the series.

Included with this soil in mapping are small areas where slope is more than 6 percent. Also included are small areas where a somewhat compacted subsoil layer is at a depth of about 28 inches and a few areas, mostly at the heads of small drainageways, where the soil is severely eroded.

Runoff is medium on this soil, and erosion is the major hazard in use and management. The soil is suited to all crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops.

Because of moderately slow permeability, this moderately well drained soil has severe limitations for residential development unless public sewers are available. If public sewers are available, limitations for this use are moderate. Capability unit IIe-3.

Newark Series

The Newark series consists of deep, somewhat poorly drained, nearly level soils on bottom lands. These soils formed in alluvium derived from Ohio River sediment. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is dark-brown silty clay loam about 8 inches thick. The underlying material, to a depth of 60 inches, is firm silty clay loam. It is dark brown and mottled in the upper 7 inches; grayish brown and mottled in the next 35 inches; and yellowish brown, strong brown, and gray in the lower 10 inches.

Available water capacity is high in Newark soils, and permeability is moderately slow. These soils have a seasonal high water table. The content of organic matter is moderate.

Representative profile of Newark silty clay loam in a cultivated field, 400 feet north and 20 feet east of the SW. corner of NW¼SE¼ sec. 34, T. 7 S., R. 11 W.:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silty clay loam; weak, fine, granular structure; friable; neutral; abrupt, smooth boundary.

Cl—8 to 15 inches, dark-brown (10YR 4/3) silty clay loam; common, medium, faint, dark grayish-brown (10YR 4/2) mottles; weak, medium, subangular blocky structure; firm; few mica flakes; neutral; gradual, smooth boundary.

C2g—15 to 26 inches, grayish-brown (2.5Y 5/2) silty clay loam; firm; many, medium, distinct, brown (10YR 4/3) mottles; weak, medium, subangular blocky structure; few, thin, discontinuous, dark-gray (10YR 4/1) coatings in channels and pores; few mica flakes; neutral; gradual, smooth boundary.

C3g—26 to 50 inches, grayish-brown (10YR 5/2) silty clay loam; common, medium, faint, brown (10YR 4/3) and common, fine, distinct, dark-brown (7.5YR 4/4) mottles; very weak, coarse, subangular blocky structure; firm; few mica flakes; neutral; gradual, smooth boundary.

C4—50 to 60 inches, yellowish-brown (10YR 5/4), gray (10YR 6/1), and strong-brown (7.5YR 5/6) silty clay loam; massive; firm; neutral.

The Ap horizon ranges from dark grayish brown (2.5Y 4/2) to brown (10YR 4/3) in color. The Cl horizon is dark grayish brown (2.5Y 4/2) to

yellowish brown (10YR 5/4) and has mottles in shades of brown or gray. The C2g horizon is dark grayish brown (2.5Y 4/2) to light brownish gray (10YR 6/2) and has common mottles in shades of brown. The C1 and C2g horizons are light silty clay loam or silty clay loam. The C4 horizon is silty clay loam to heavy silt loam. Reaction ranges from slightly acid to mildly alkaline throughout the profile.

Newark soils are associated with Rahm, Lindside, and Huntington soils. They have drainage characteristics similar to those of Rahm soils. Newark soils are not so well drained as Lindside and Huntington soils. They are less acid in the lower part of the profile than Rahm soils.

Newark silty clay loam (0 to 2 percent slopes) (Nw).—This soil is mostly in long narrow depressions or sloughs adjacent to well drained Huntington and moderately well drained Lindside soils. Included in mapping are areas of very poorly drained soils less than 1 acre in size.

Runoff is very slow on this soil. Flooding is the major hazard, and wetness is a limitation in use and management. If drained, this soil is suited to corn, soybeans, and pasture. Alfalfa and small grain are subject to severe flood damage in winter and spring.

Because of wetness and flooding, this soil has severe limitations for residential development. Capability unit IIw-7.

Patton Series

The Patton series consists of deep, poorly drained, nearly level soils on terraces. These soils formed in loamy lacustrine sediment. The native vegetation is grasses, sedges, and swamp forest.

In a representative profile the surface layer is very dark gray and very dark grayish-brown silty clay loam about 11 inches thick. The subsoil is mottled, firm silty clay loam about 30 inches thick. The upper part is dark gray, and the lower part is olive gray. The underlying material, to a depth of 60 inches, is mottled, light olive-brown light silty clay loam.

Available water capacity is high in Patton soils, and permeability is moderate. These soils have a seasonal high water table. The content of organic matter is high.

Representative profile of Patton silty clay loam in a cultivated field, 175 feet east and 450 feet south of the NW. corner of sec. 24, T. 6 S., R. 10 W.:

Ap—0 to 7 inches, very dark gray (10YR 3/1) silty clay loam; weak, fine, granular structure; friable; neutral; abrupt, smooth boundary.

A12—7 to 11 inches, very dark grayish-brown (10YR 3/2) silty clay loam; weak, fine, granular structure; friable; neutral; clear, wavy boundary.

B21g—11 to 20 inches, dark-gray (5Y 4/1) silty clay loam; few, medium, light olive-brown (2.5Y 5/4) mottles; weak, medium, subangular blocky structure; firm; neutral; clear, wavy boundary.

B22g—20 to 41 inches, olive-gray (5Y 5/2) silty clay loam; common, fine, faint, pale-yellow (2.5Y 7/4) mottles; weak, coarse, prismatic structure that parts to moderate, medium, subangular blocky; firm; neutral; clear, wavy boundary.

Cg—41 to 60 inches, light olive-brown (2.5Y 5/6) light silty clay loam; common, medium, distinct, gray (5Y 6/1) mottles; massive; firm; neutral.

The Ap horizon ranges from very dark gray (10YR 3/1) to very dark brown (10YR 2/2) or very dark grayish brown (10YR 3/2) in color. The C horizon is silty clay loam to stratified silty clay loam and silt loam. Reaction is neutral to moderately alkaline in this horizon.

Patton soils are associated with Evansville, Zipp, and Henshaw soils. They have drainage characteristics similar to those of Evansville soils, but they have a darker colored A horizon. Patton soils contain less clay in the solum and have a darker colored A horizon than Zipp soils. They have a darker colored A horizon and a grayer solum than Henshaw soils.

Patton silty clay loam (0 to 2 percent slopes) (Pa).—This soil is in broad areas on lakebed terraces. Included in mapping are small areas where the surface layer is silt loam. Also included are small areas where the surface layer is dark gray or dark grayish brown.

Runoff is very slow or ponded on this soil, and wetness is the major limitation in use and management. Seedbeds often are cloddy if plowed when too wet or too dry. If drained, this soil is suited to corn, soybeans, small grain, hay, and pasture.

Because of wetness and surface ponding, this soil has severe limitations for residential development. Capability unit IIw-1.

Princeton Series

The Princeton series consists of deep, well-drained, gently sloping soils on uplands. These soils formed in wind-deposited sand and coarse silt. The native vegetation is hardwood trees.

In a representative profile the surface layer is brown fine sandy loam about 7 inches thick. The subsurface layer is about 4 inches of dark yellowish-brown fine sandy loam. The subsoil is about 35 inches thick. The upper 19 inches is brown firm sandy clay loam and light sandy clay loam; the next 8 inches is brown, friable heavy sandy loam; and the lower 8 inches is dark yellowish-brown and brown, banded sandy loam and light sandy clay loam. The underlying material, to a depth of 60 inches, is dark yellowish-brown loamy sand.

Available water capacity is moderate in Princeton soils, and permeability is moderate. The content of organic matter is moderate.

Representative profile of Princeton fine sandy loam, 2 to 6 percent slopes, in a cultivated field, 1,150 feet north and 245 feet east of center of sec. 35, T. 6 S., R. 10 W.:

Ap—0 to 7 inches, brown (10YR 4/3) fine sandy loam; weak, fine, granular structure; very friable; slightly acid; abrupt, smooth boundary.

A2—7 to 11 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, coarse, platy structure that parts to weak, coarse, granular; very friable; medium acid; clear, smooth boundary.

B21t—11 to 20 inches, brown (7.5YR 4/4) sandy clay loam; moderate, medium, subangular blocky structure; firm; thin, continuous, reddish-brown (5YR 4/4) clay films on faces of peds; medium acid; clear, wavy boundary.

B22t—20 to 30 inches, brown (7.5YR 4/4) light sandy clay loam; moderate, medium and coarse, subangular blocky structure; firm; thin, continuous, reddish-brown (5YR 4/4) clay films on faces of peds; strongly acid; gradual, wavy boundary.

B23t—30 to 38 inches, brown (7.5YR 5/4) heavy sandy loam; weak, coarse, subangular blocky structure; friable; thin, discontinuous, reddish-brown (5YR 4/4) clay films on faces of peds; medium acid; gradual, wavy boundary.

B3—38 to 46 inches, dark yellowish-brown (10YR 4/4) and brown (7.5YR 5/4), banded sandy loam, and light sandy clay loam; weak, coarse, subangular blocky structure; friable; medium acid; clear, smooth boundary.

C—46 to 60 inches, dark yellowish-brown (10YR 4/4) loamy sand; single grained; very friable; slightly acid.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to dark brown (10YR 4/3) or brown (10YR 5/3) in color. The B2 horizon is brown (7.5YR 4/4) or yellowish brown (10YR 5/4-5/6). The B21t and B22t horizons are sandy clay loam to light clay loam. The C horizon is medium acid or slightly acid.

Princeton soils are associated with, and have drainage characteristics similar to, Wheeling soils. They are sandier throughout and are not so deeply leached as Wheeling soils.

Princeton fine sandy loam, 2 to 6 percent slopes (PrB).—This soil is on narrow ridgetops and side slopes in dunelike positions on Ohio River terraces. Included in mapping are small level areas. Also included are some areas where slope is more than 6 percent and small areas where the surface layer is loamy sand and the subsoil is banded loamy sand and fine sandy loam.

Runoff is medium on this soil. Runoff and erosion are hazards, and the moderate available water capacity is a limitation in use and management. This soil is suited to all

crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops. In years of below average rainfall or poor rainfall distribution, crops are damaged by drought.

This soil has slight limitations for residential development. Capability unit IIe-11.

Ragsdale Series

The Ragsdale series consists of deep, very poorly drained, nearly level soils on uplands. These soils formed in more than 5 feet of loess. The native vegetation is swamp grasses and swamp forest.

In a representative profile the surface layer is silt loam about 16 inches thick. It is very dark brown in the upper 10 inches and very dark gray in the lower 6 inches. The subsoil is about 29 inches thick. It is mottled, gray, firm silty clay loam in the upper 11 inches and mottled, light olive-brown, firm light silty clay loam in the lower 18 inches. The underlying material, to a depth of 60 inches, is light yellowish-brown and brownish-yellow silt loam.

Available water capacity is high in Ragsdale soils, and permeability is slow. These soils have a seasonal high water table. The content of organic matter is high.

Representative profile of Ragsdale silt loam, 300 feet south and 660 feet west of the NE. corner of sec. 33, T. 4 S., R. 11 W.:

Ap—0 to 10 inches, very dark brown (10YR 2/2) silt loam; weak, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A12—10 to 16 inches, very dark gray (10YR 3/1) silt loam; moderate, fine, subangular blocky structure; friable; slightly acid; gradual, irregular boundary.

B21tg—16 to 27 inches, gray (10YR 5/1) silty clay loam; common, medium, distinct, olive-gray (5Y 5/2) and yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; discontinuous very dark grayish-brown (10YR 3/2) clay films and coatings on faces of peds; slightly acid; gradual, irregular boundary.

B22tg—27 to 45 inches, light olive-brown (2.5Y 5/4) light silty clay loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles; few, medium, distinct, brownish-yellow (10YR 6/6) mottles; weak, coarse to very coarse, prismatic structure that parts to moderate, coarse, subangular blocky; firm; thin, discontinuous, dark-gray (10YR 4/1) clay films on faces of peds; neutral; clear, smooth boundary.

C—45 to 60 inches, light yellowish-brown (2.5Y 6/4) and brownish-yellow (10YR 6/6) silt loam; massive; friable; light brownish-gray (10YR 6/2) discontinuous films in voids; moderately alkaline (calcareous).

The solum ranges from 35 to 50 inches in thickness. The A horizon is 14 to 18 inches thick and ranges from very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2) in color. The B21tg horizon is gray (10YR 5/1) to grayish brown (2.5Y 5/2). The B22tg horizon is light olive brown (2.5Y 5/4) to yellowish brown (10YR 5/6).

Ragsdale soils are associated with Patton and Evansville soils. They are less clayey than Patton soils and have a darker colored A horizon than Evansville soils.

Ragsdale silt loam (0 to 2 percent slopes) (Ra).—This soil is in large areas in depressions on nearly level uplands. Some areas adjacent to and at the toe of slopes have a 6- to 14-inch deposit of silty overwash that is lighter colored than the surface layer of this soil. Included in mapping are some areas where the surface layer is light silty clay loam.

Runoff on this soil is very slow, or the surface is ponded. Wetness is the major limitation in use and management. If a suitable drainage system is established and maintained, this soil is suited to all crops commonly grown in the county. Corn, soybeans, small grain, and hay are the main crops.

Because of wetness and slow permeability, this soil has severe limitations for residential development, even if public sewers are available. Capability unit IIw-1.

Rahm Series

The Rahm series consists of deep, somewhat poorly drained, nearly level soils on bottom lands. These soils formed in about 26 inches of neutral alluvium and the underlying older strongly acid alluvium. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is dark-brown silty clay loam about 10 inches thick. The underlying material is firm, mottled, light brownish-gray light silty clay loam to a depth of 16 inches and firm, mottled, grayish-brown silty clay loam to a depth of 26 inches. Below this is an older buried soil of firm, mottled, light brownish-gray silty clay loam to a depth of 70 inches.

Available water capacity is high in Rahm soils, and permeability is moderately slow. These soils have a seasonal high water table. The content of organic matter is moderate.

Representative profile of Rahm silty clay loam in a cultivated field, 925 feet east and 520 feet south of the center of sec. 22, T. 7 S., R. 11 W.:

Ap—0 to 10 inches, dark-brown (10YR 4/3), dark yellowish-brown (10YR 3/4) crushed, silty clay loam; moderate, medium, granular structure; friable; few mica flakes; neutral; abrupt, smooth boundary.

C1g—10 to 16 inches, light brownish-gray (10YR 6/2) light silty clay loam; few, fine, faint, dark grayish-brown (10YR 4/2) mottles; moderate, weak, prismatic structure that parts to weak, fine, subangular blocky; firm; few mica flakes; neutral; gradual, smooth boundary.

C2g—16 to 26 inches, grayish-brown (10YR 5/2) silty clay loam; common, medium, distinct, gray (10YR 6/1) and dark yellowish-brown (10YR 4/4) mottles; moderate, very weak, prismatic structure; firm; few, fine, very dark grayish-brown (10YR 3/2) concretions; few mica flakes; neutral; clear, smooth boundary.

IIB1b—26 to 58 inches, light brownish-gray (2.5Y 6/2) silty clay loam; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; few mica flakes; strongly acid; gradual, diffuse boundary.

IIB2b—58 to 70 inches, light brownish-gray (10YR 6/2) silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; moderate, medium, subangular blocky structure; firm; thin, patchy, grayish-brown (10YR 5/2) clay films on faces of peds; few mica flakes; strongly acid.

The Ap horizon ranges from dark brown (10YR 3/3) to yellowish brown (10YR 5/4) in color. The C horizon is heavy silt loam to silty clay loam. Depth to the IIB1b horizon ranges from 19 to 26 inches.

Rahm soils are associated with and have drainage characteristics similar to Newark and Wakeland soils. They are more clayey than Wakeland soils and are more acid in the lower part of the profile than Newark soils.

Rahm silty clay loam (0 to 2 percent slopes) (Rh).—This soil is in elongated areas in old drainage channels that are adjacent to slightly higher positioned terrace soils. Included in mapping are small areas where the surface layer is silt loam.

Flooding is a hazard, and wetness is a limitation in use and management of this soil. If drained, this soil is suited to corn, soybeans, hay, and pasture. Alfalfa and small grain are subject to severe flood damage in winter and in spring.

Because of flooding and a seasonal high water table, this soil has severe limitations for residential development. Capability unit IIw-7.

Reesville Series

The Reesville series consists of deep, somewhat poorly drained, nearly level soils on uplands and in lakebeds. These

soils formed in more than 5 feet of loess. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is dark grayish-brown silt loam about 9 inches thick. The subsurface layer is light brownish-gray silt loam about 2 inches thick. The subsoil is about 24 inches thick. The upper 3 inches is mottled, pale-brown, friable heavy silt loam, and the lower 21 inches is mottled, pale-brown and yellowish-brown, firm silty clay loam. The underlying material, to a depth of 60 inches, is light olive-brown, yellowish-brown, and grayish-brown silt loam.

Available water capacity is high in Reesville soils, and permeability is moderately slow. These soils have a seasonal high water table. The content of organic matter is moderate.

Representative profile of Reesville silt loam in a cultivated field, 950 feet east and 925 feet south of the center of sec. 33, T. 4 S., R. 11 W.:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A2—9 to 11 inches, light brownish-gray (10YR 6/2) silt loam; few, fine, faint, yellowish-brown (10YR 5/4) mottles; weak, medium, platy structure; friable; slightly acid; clear, smooth boundary.

B1g—11 to 14 inches, pale-brown (10YR 6/3) heavy silt loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, medium,subangular blocky structure; friable; light-gray (10YR 7/1) silt coatings on faces of peds and in old root channels; medium acid; clear, wavy boundary.

B21t—14 to 22 inches, pale-brown (10YR 6/3) and yellowish-brown (10YR 5/4) silty clay loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles; moderate, medium, subangular blocky structure; firm; thin, continuous, dark grayish-brown (10YR 4/2) clay films on faces of peds; light-gray (10YR 7/1) silt coatings on faces of peds and in cracks; strongly acid; clear, wavy boundary.

B22t—22 to 35 inches, yellowish-brown (10YR 5/4) silty clay loam; common, medium, distinct, grayish-brown (10YR 5/2) and common, medium, faint, brownish-yellow (10YR 6/6) mottles; moderate, medium and coarse, subangular blocky structure; firm; thin, continuous, gray (10YR 5/1) clay films on faces of peds; medium acid; clear, smooth boundary.

C—35 to 60 inches, light olive-brown (2.5Y 5/4), yellowish-brown (10YR 5/6), and grayish-brown (2.5Y 5/2) silt loam; friable; moderately alkaline (calcareous).

The solum ranges from 32 to 44 inches in thickness. The Ap horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2) in color. The B2 horizon is heavy silt loam to silty clay loam.

Reesville soils are associated with Iva and Iona soils. They have drainage characteristics similar to those of Iva soils, but they have a thinner solum than that of Iva soils. Reesville soils have poorer drainage characteristics than Iona soils.

Reesville silt loam (0 to 2 percent slopes (Rs).—This soil is on broad upland flats and in lakebeds. Included in mapping are small areas of moderately well drained soils. Also included are small areas of very poorly drained Ragsdale soils and Patton soils.

Runoff is slow on this soil, and wetness is the major limitation in use and management. This soil is suited to all crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops. Drainage is required for satisfactory crop production.

Because of wetness and moderately slow permeability, this soil has severe limitations for residential development unless public sewers are available. The seasonal high water table is a moderate limitation to such use if public sewers are available. Capability unit IIw-2.

Sciotoville Series

The Sciotoville series consists of deep, moderately well drained, nearly level and gently sloping soils on terraces. A firm and brittle fragipan is at a depth of about 23 inches. These soils formed in loamy, strongly acid alluvium. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is dark grayish-brown silt loam about 10 inches thick. The subsurface layer is brown silt loam about 2 inches thick. The subsoil is about 40 inches thick. The upper 11 inches is yellowish-brown, firm light silty clay loam, and the lower 29 inches is a fragipan of yellowish-brown and dark-brown, very firm and brittle light silty clay loam and heavy silt loam. The underlying material, to a depth of 60 inches, is mottled, yellowish-brown silt loam that has lenses of very fine sand.

Available water capacity is moderate in Sciotoville soils, and permeability is very slow. These soils have a seasonal high water table. The content of organic matter is moderate.

Representative profile of Sciotoville silt loam, 0 to 2 percent slopes, in a cultivated field, 990 feet north and 100 feet west of the center of sec. 3, T. 7 S., R. 11 W.:

Ap—0 to 10 inches, dark grayish-brown (10YR4/2) silt loam; weak, fine, granular structure; friable; neutral; abrupt, smooth boundary.

A2—10 to 12 inches, brown (10YR 5/3) silt loam; weak, medium, platy structure; friable; medium acid; clear, smooth boundary.

B21t—12 to 17 inches, yellowish-brown (10YR 5/4) light silty clay loam; firm; thin, patchy, brown (10YR 5/3) clay films on faces of peds; few light brownish-gray (10YR 6/2) silt coatings; few mica flakes; strongly acid; clear, smooth boundary.

B22t—17 to 23 inches, yellowish-brown (10YR 5/4) light silty clay loam; few, fine, faint, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/8) mottles; firm; thin, discontinuous, grayish-brown (10YR 5/2) and dark-brown (7.5YR 4/4) clay films on faces of peds; few light-gray (10YR 7/1) silt coatings; few mica flakes; very strongly acid; clear, wavy boundary.

Bx1—23 to 36 inches, yellowish-brown (10YR 5/4) light silty clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; moderate, coarse, prismatic structure; very firm and brittle; thin, continuous, dark-brown (7.5YR 4/4) and grayish-brown (10YR 5/2) clay films on faces of peds; common light-gray (10YR 7/1) silt coatings on all prisms; few mica flakes; very strongly acid; gradual, wavy boundary.

Bx2—36 to 52 inches, dark-brown (7.5YR 4/4) and yellowish-brown (10YR 5/4) heavy silt loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, very coarse, prismatic structure; very firm and brittle; thin, discontinuous, reddish-brown (5YR 4/3) clay films and light-gray (10YR 7/1) silt coatings on faces of peds; few mica flakes; very strongly acid; gradual, wavy boundary.

C—52 to 60 inches, yellowish-brown (10YR 5/4) silt loam that has lenses of very fine sand; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; massive; friable; few mica flakes; strongly acid.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3) in color. The B2 horizon is silt loam or light silty clay loam. The Bx horizon ranges from 24 to 36 inches in thickness. Depth to the fragipan ranges from 20 to 28 inches.

The content of sand in these soils is less than that for the lower limit of the defined range for the Sciotoville series, and the content of silt is higher than that for the upper limit. These differences, however, do not alter the usefulness and behavior of the soils.

Sciotoville soils are associated with Wheeling, Weinbach, and Ginat soils. They are not so well drained as Wheeling soils, and unlike Wheeling soils they have a fragipan. Sciotoville soils are better drained than Weinbach and Ginat soils. They are browner throughout the profile than Ginat soils and are browner in the upper part of the B horizon than Weinbach soils.

Sciotoville silt loam, 0 to 2 percent slopes (ScA).—This soil is on broad areas and long, narrow areas on terraces. It has the profile described as representative of the series. Included in mapping are small areas where the surface layer is loam.

Runoff is slow on this soil. The very slowly permeable fragipan and the moderate available water capacity are limitations in use and management. Corn, soybeans, small grain, hay, and pasture are the main crops. Because of the fragipan,

which restricts downward root growth and movement of water, alfalfa and other deep-rooted crops are not well suited to this soil. In prolonged dry seasons crops are subject to drought damage.

Because of the very slowly permeable fragipan, this soil has severe limitations for residential development unless public sewers are available. If public sewers are available, limitations for residential development are slight. Capability unit IIw-5.

Sciotoville silt loam, 2 to 6 percent slopes, eroded (ScB2).—This soil is in long, narrow areas on terraces. It has a profile similar to that described as representative of the series, but the surface layer is thinner and the fragipan is closer to the surface. Included in mapping are small areas of severely eroded soils and soils that have a loam surface layer.

Runoff is medium on this soil. Erosion is a hazard, and the very slowly permeable fragipan and moderate available water capacity are limitations in use and management. Corn, soybeans, small grain, hay, and pasture are the main crops. The fragipan restricts the rooting of deep-rooted crops. In years of below average or poorly distributed rainfall, crops are subject to damage from drought.

Because of the very slowly permeable fragipan, this soil has severe limitations for residential development unless public sewers are available. Limitation for such use are slight if public sewers are available. Capability unit IIe-7.

Stendal Series

The Stendal series consists of deep, somewhat poorly drained, nearly level soils on bottom lands. These soils formed in acid loamy alluvium. The native vegetation is hardwood trees.

In a representative profile the surface layer is grayish-brown silt loam about 11 inches thick. The underlying material, to a depth of about 45 inches, is mottled, grayish-brown and light brownish-gray friable silt loam. Below this, to a depth of about 60 inches, it is light brownish-gray and pale-brown silt loam.

Available water capacity is high in Stendal soils, and permeability is moderate. These soils have a seasonal high water table. The content of organic matter is low.

Representative profile of Stendal silt loam in a cultivated field, 940 feet west and 600 feet south of the center of sec. 17, T. 5 S., R. 10 W.:

Ap—0 to 11 inches, grayish-brown (10YR 5/2) silt loam; weak, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

C1g—11 to 26 inches, grayish-brown (10YR 5/2) silt loam; many, medium, distinct, yellowish-brown (10YR 5/4) mottles; weak, medium, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

C2g—26 to 45 inches, light brownish-gray (10YR 6/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) and dark yellowish-brown (10YR 4/4) mottles; weak, coarse, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

C3g—45 to 60 inches, light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) silt loam; massive; friable; common, medium, distinct, black (10YR 2/1) iron and manganese concretions; medium acid.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to light brownish gray (10YR 6/2) in color. In places the C1g and C2g horizons have brown (10YR 5/3) mottles. In places the C3g horizon is loam, and stratified lenses of fine sand are in some profiles.

Stendal soils are associated with Wakeland, Newark, and Bonnie soils. They have drainage characteristics similar to those of Wakeland and Newark soils. Stendal soils are more acid than the Wakeland and Newark soils and contain less clay than Newark soils. Stendal soils are not so gray in the C2g and C3g horizons as Bonnie soils.

Stendal silt loam (0 to 2 percent slopes) (St).—This soil is on bottom lands along small streams that drain the acid soils of the uplands. Included in mapping are small areas of poorly drained soils. Also included are small areas where the content of sodium is very high. Sodium spots are very light gray in color, and the sodium is toxic to plants (fig. 24). They are shown on the map by a special symbol.

Runoff is slow on this soil. Wetness is a limitation, and flooding is a hazard in use and management. If a suitable drainage system is established and maintained, this soil is suited to most crops commonly grown in the county. Corn, soybeans, hay, and pasture are the main crops. Small grain and alfalfa are subject to severe flood damage in winter and early in spring.

Because of wetness and the hazard of flooding, this soil has severe limitations for residential development. Capability unit IIw-7.

Figure 24.—The toxic effect of sodium at this site has killed all crops.

Uniontown Series

The Uniontown series consists of deep, well-drained, gently sloping soils on lakebed terraces. These soils formed in loess and the underlying loamy lacustrine sediment. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is brown and yellowish-brown silt loam about 6 inches thick. The subsoil is about 34 inches thick. The upper 29 inches is yellowish-brown, firm silty clay loam, and the lower 5 inches is yellowish-brown, firm heavy silty clay loam. The underlying material, to a depth of about 60 inches, is light olive-brown, stratified silty clay and silty clay loam that has lenses of silt loam.

Available water capacity is high in Uniontown soils, and permeability is moderately slow. The content of organic matter is low.

Representative profile of Uniontown silt loam, 2 to 6 percent slopes, eroded, in a cultivated field, 450 feet south of the center of sec. 7, T. 7 S., R. 11 W.:

Ap—0 to 6 inches, brown (10YR 5/3) and 20 percent yellowish-brown (10YR 5/4) silt loam; weak, fine, granular structure; friable; medium acid; abrupt, smooth boundary.

B1t—6 to 10 inches, yellowish-brown (10YR 5/4) light silty clay loam; weak, medium, subangular blocky structure; thin, patchy, brown (10YR 5/3) clay films on faces of peds; firm; medium acid; clear, smooth boundary.

B21t—10 to 20 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm; thin, continuous, brown (7.5YR 5/4) clay films on faces of peds; strongly acid; gradual, wavy boundary.

B22t—20 to 35 inches, yellowish-brown (10YR 5/6) silty clay loam; weak, medium, prismatic structure that parts to moderate, coarse, subangular blocky; firm; thin, continuous, dark-brown (7.5YR 4/4) clay films and light brownish-gray (10YR 6/2) silt coatings on faces of peds; strongly acid; abrupt, wavy boundary.

IIB23t—35 to 40 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; strong, coarse, angular blocky structure; firm; thin, discontinuous, brown (10YR 5/3) clay films and light brownish-gray (10YR 6/2) silt coatings on faces of peds; neutral; gradual, smooth boundary.

IIC—40 to 60 inches, light olive-brown (2.5Y 5/6) stratified silty clay and silty clay loam that has lenses of silt loam; massive; firm; common, fine, lime nodules; moderately alkaline (calcareous).

The Ap horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3) in color. The B21t and B22t horizons are yellowish-brown (10YR 5/6) to light olive-brown (2.5Y 5/4) light silty clay loam or silty clay loam. Depth to the IIB2 horizon ranges from 30 to 40 inches.

Uniontown soils are associated with Markland and Alford soils, and their drainage characteristics are similar to those of these soils. They have less clay in the B2 horizon and a thicker loess cap than Markland soils. Uniontown soils have more clay in the lower part of the solum than Alford soils.

Uniontown silt loam, 2 to 6 percent slopes, eroded (UnB2).—This soil is on small ridgetops and sides of drainageways on terraces. The slopes are mostly short and irregular.

Included with this soil in mapping are small areas where slope is more than 6 percent. Also included are small areas of severely eroded soils that have a yellowish-brown light silty clay loam surface layer.

Runoff is medium on this soil, and erosion is the major hazard in use and management. The soil is suited to corn, soybeans, small grain, hay, and pasture.

Because of the moderately slow permeability, this soil has severe limitations for residential development unless public sewers are available. Limitations for such use are slight if public sewers are available. Capability unit IIe-3.

Wakeland Series

The Wakeland series consists of deep, somewhat poorly drained, nearly level soils on bottom lands. These soils formed in nonacid silt loam alluvium. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is dark grayish-brown silt loam about 9 inches thick. The underlying material, to a depth of about 38 inches, is mottled, grayish-brown, friable silt loam. Below this, to a depth of about 60 inches, it is mottled, yellowish-brown silt loam.

Available water capacity is high in Wakeland soils, and permeability is moderate. These soils have a seasonal high water table. The content of organic matter is moderate.

Representative profile of Wakeland silt loam in a cultivated field, 640 feet south and 100 feet east of the NW. corner of sec. 30, T. 4 S., R. 10 W.:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; neutral; abrupt, smooth boundary.

C1g—9 to 21 inches, grayish-brown (10YR 5/2) silt loam; few, fine, faint, pale-brown (10YR 6/3) mottles; weak, fine, granular structure; friable; common, fine, distinct, dark yellowish-brown (10YR 4/4) iron stains; slightly acid; clear, smooth boundary.

C2g—21 to 38 inches, grayish-brown (10YR 5/2) silt loam; many, fine, distinct, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/6) mottles; weak, medium, granular structure; friable; slightly acid; clear, wavy boundary.

C3—38 to 60 inches, yellowish-brown (10YR 5/4) silt loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles; gray (10YR 6/1) silt streaks; massive; firm; neutral.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2) or brown (10YR 5/3) in color. The C1g and C2g horizons are gray (10YR 5/1), grayish brown (10YR 5/2), or brown (10YR 5/3) and have many gray (10YR 5/1) and yellowish-brown (10YR 5/6) mottles. Reaction ranges from medium acid to neutral. The C3 horizon is light silty clay loam to silt loam and has thin strata of loam or sandy loam.

Wakeland soils are associated with Birds and Stendal soils. They are better drained than Birds soils, and they are less acid than Stendal soils.

Wakeland silt loam (0 to 2 percent slopes) (Wa).—This soil is on bottom lands along small streams. Included in mapping are small areas of soil that has dark-gray silt loam or light silty clay loam at a depth of 20 to 30 inches.

Runoff is slow on this soil. Wetness is a limitation, and flooding is a hazard in use and management (fig. 25). If a suitable drainage system is established and maintained, this soil is suited to most crops commonly grown in the county. Corn, small grain, hay, and pasture are the main crops.

Because of wetness and the hazard of flooding, this soil has severe limitations for residential development. Capability unit IIw-7.

Weinbach Series

The Weinbach series consists of deep, somewhat poorly drained, nearly level soils on terraces. A very firm and brittle fragipan is at a depth of about 20 inches. These soils formed in loamy, acid, stratified Ohio River alluvium. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is dark grayish-brown silt loam about 9 inches thick. The subsurface layer is mottled, brown silt loam about 4 inches thick. The subsoil is about 44 inches thick. The upper 10 inches is mottled, light brownish-gray, friable silt loam; the next 23 inches is a fragipan of mottled, light brownish-gray, very firm and brittle silty clay loam and light silty clay loam; and the lower 11 inches is dark-brown, firm light silty clay loam. The underlying material, to a depth of 65 inches, is brown and dark-brown, stratified light silty clay loam and silt loam that has thin lenses of very fine sand.

Available water capacity is moderate in Weinbach soils, and permeability is very slow. These soils have a seasonal high water table. The content of organic matter is moderate.

Representative profile of Weinbach silt loam in a cultivated field, 330 feet west and 300 feet north of the SE. corner of NE¼ sec. 4, T. 7 S., R. 10 W.:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; few mica flakes; neutral; abrupt, smooth boundary.

A2—9 to 13 inches, brown (10YR 5/3) silt loam; few, fine, faint, light brownish-gray (10YR 6/2) mottles; moderate, coarse, granular structure; friable; few mica flakes; strongly acid; clear, smooth boundary.

B1g—13 to 23 inches, light brownish-gray (10YR 6/2) heavy silt loam; many, medium, faint, pale-brown (10YR 6/3) mottles; weak, medium, subangular blocky structure; friable; common mica flakes; very strongly acid; abrupt, wavy boundary.

Bx1g—23 to 34 inches, light brownish-gray (10YR 6/2) silty clay loam; common, fine, faint, pale-brown (10YR 6/3) and few, fine, distinct, yellowish-brown (10YR 5/4) mottles; strong, medium and coarse, prismatic structure; very firm and brittle; thin, continuous, gray (10YR 6/1) clay films on faces of peds; few

Figure 25.—**Flooding of Wakeland silt loam. McGary soils on terraces have not flooded.**

very dark brown (10YR 2/2) concretions; few mica flakes; very strongly acid; gradual, wavy boundary.

Bx2g—34 to 46 inches, light brownish-gray (10YR 6/2) light silty clay loam; common, fine and medium, distinct, brown (10YR 5/3) and dark-brown (10YR 4/3) mottles; strong, very coarse, prismatic structure; very firm and brittle; thin, gray (10YR 6/1) clay films on faces of peds; light-gray (10YR 7/1) silt streaks; few black (10YR 2/1) concretions; common mica flakes; very strongly acid; gradual, smooth boundary.

B3—46 to 57 inches, dark-brown (7.5YR 4/4) light silty clay loam; moderate, very coarse, prismatic structure; firm; thin, discontinuous, grayish-brown clay films on faces of peds; light brownish-brown clay films on faces of peds; light brownish-gray (10YR 6/2) silt streaks and coatings; common mica flakes; strongly acid; gradual, wavy boundary.

C—57 to 65 inches, brown (10YR 5/3) and dark-brown (7.5YR 4/4), stratified light silty clay loam and silt loam that has thin lenses of very fine sand; massive; friable; common mica flakes; strongly acid.

The solum ranges from 48 to 60 inches in thickness. The Ap horizon ranges from dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2) or brown (10YR 5/3) in color. The Bx horizon is silty clay loam to heavy silt loam. Depth to the Bx horizon ranges from 18 to 26 inches. The C horizon is stratified silty clay loam, silt loam, and fine or very fine sand. In places fine gravel is in the lower part of this horizon. Content of fine mica flakes is variable.

Weinbach soils are associated with Sciotoville and Ginat soils and are similar to Bartle soils. They have poorer drainage than Sciotoville soils, and they are browner throughout the profile than Ginat soils. Weinbach soils are browner in the lower part of the solum than Bartle soils.

Weinbach silt loam (0 to 2 percent slopes) (Wb).—This soil is on broad, long areas on terraces. Included in mapping are small areas where the surface layer is loam. Also included are small areas of moderately well drained Sciotoville soils.

Runoff is slow on this soil. Wetness and the very slowly permeable fragipan are major limitations to use and management. If drained, this soil is suited to corn, small grain, hay, and pasture. Because of the fragipan, which restricts downward root growth and movement of water, this soil is not well suited to alfalfa and other deep-rooted crops. In years when rainfall is below average or poorly distributed, crops are subject to drought damage.

Because of wetness and the very slowly permeable fragipan, this soil has severe limitations for residential development unless public sewers are available. Limitations for such use are moderate if public sewers are available. Capability unit IIw-3.

Wellston Series

The Wellston series consists of deep, well-drained, strongly sloping to very steep soils on uplands. These soils formed in loess and the underlying material that weathered from sandstone and shale. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is brown silt loam about 7 inches thick. The subsoil is about 28 inches thick. The upper 5 inches is yellowish-brown, friable silt loam, and the lower 23 inches is strong-brown and yellowish-brown, firm light silty clay loam. The underlying material, to a depth of about 48 inches, is yellowish-brown and light yellowish-brown silt loam. Shale and sandstone bedrock is at a depth of about 48 inches.

Available water capacity is high in Wellston soils, and permeability is moderate. The content of organic matter is low.

Representative profile of Wellston silt loam, 18 to 25 percent slopes, eroded, in a reforested area, 1,100 feet north and 3,670 feet west of the SE. corner of sec. 30, T. 5 S., R. 11 W.:

Ap—0 to 7 inches, brown (10YR 5/3) silt loam; weak, medium, platy structure that parts to weak, fine, subangular blocky; friable; very strongly acid; clear, smooth boundary.

B1—7 to 12 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine and medium, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

B21t—12 to 25 inches, strong-brown (7.5YR 5/6) and yellowish-brown (10YR 5/6) light silty clay loam; moderate, fine and medium, subangular blocky structure; firm; thin, discontinuous, reddish-brown (5YR 4/4) clay films on faces of peds; very strongly acid; clear, smooth boundary.

IIB22t—25 to 35 inches, yellowish-brown (10YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; firm; thin, discontinuous, brown (7.5YR 4/4) clay films on faces of peds; few partly weathered sandstone fragments, quantity increases with depth; very strongly acid; clear, smooth boundary.

IIC—35 to 48 inches, yellowish-brown (10YR 5/6) and light yellowish-brown (10YR 6/4) silt loam; massive; firm; very strongly acid.

R—48 inches, sandstone and shale bedrock.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4) in color. The B2 horizon is 18 to 30 inches thick. The IIB22t horizon is light silty clay loam or light clay loam. Depth to bedrock ranges from 40 to 60 inches. The C horizon contains enough sand to give it a gritty feel.

Wellston soils are associated with Alford and Zanesville soils. They have drainage characteristics similar to those of Alford soils. Wellston soils, unlike Zanesville soils, lack a fragipan. They have a thinner solum than Alford soils.

Wellston silt loam, 12 to 18 percent slopes, eroded (WeD2).—This soil is on the sides of natural draws and ridges. It has a profile similar to that of the soil described as representative of the series but is deeper over bedrock.

Included with this soil in mapping are small areas of slightly eroded soils in woods and areas of permanent pasture. Also included are a few areas where the soil is severely eroded and where the surface layer is mostly yellowish-brown subsoil material. In addition, a few gullies are present in places.

Runoff is rapid on this soil, and erosion is the major hazard in use and management. This soil is suited to small grain, hay, and pasture. The hazard of further erosion limits the use of this soil for row crops.

Because of slope and the hazard of further erosion, this soil has severe limitations for residential development. The need for cuts and fills and control of erosion during construction is also a limitation for this use. Capability unit IVe-3.

Wellston silt loam, 12 to 18 percent slopes, severely eroded (WeD3).—This soil is on the sides of natural draws and ridges. It has a profile similar to that described as representative of the series, but erosion has removed 6 to 8 inches of the original surface layer. The present surface layer is mostly yellowish-brown subsoil material.

Included with this soil in mapping are a few small areas of Gullied land. Also included are small areas where slopes are moderately steep.

Runoff is very rapid on this soil, and further erosion is the major hazard in use and management. This soil is suited to pasture or permanent vegetation. The effect of past erosion and the serious hazard of further erosion limit its use for most crops.

Because of slope and the hazard of further erosion, this soil has severe limitations for residential development. The need for cuts and fills and control of erosion during construction is also a limitation for this use. Capability unit VIe-1.

Wellston silt loam, 18 to 25 percent slopes, eroded (WeE2).—This soil is on the sides of natural draws and ridges. It has the profile described as representative of the series.

Included with this soil in mapping are small areas where bedrock is at a shallower depth than it is in the profile described as representative of the series. Also included are areas of severely eroded soil and small areas of Gullied land. These areas are shown on the map by a spot symbol.

Runoff is rapid on this soil, and further erosion is the major hazard in use and management. This soil is suited to permanent pasture or trees.

Because of slope, depth to bedrock, and the hazard of further erosion, this soil has severe limitations for residential development. The need for cuts and fills and control of erosion during construction is also a limitation for this use. Capability unit VIe-1.

Wellston silt loam, 25 to 50 percent slopes (WeF).—This soil is on uplands. Most areas range from 20 to 40 acres in size. This soil has a profile similar to that described as representative of the series, but it is shallower over bedrock.

Included with this soil in mapping are small areas of severely eroded soil that has a yellowish-brown surface layer. Also included are numerous gullies.

Runoff is very rapid on this soil. The hazard of erosion and steep slopes are the major limitations in use and management. This soil is suited to permanent vegetation, and about 90 percent of the acreage is wooded (fig. 26). This remaining acreage is in permanent pasture or is idle.

Because of slope and the hazard of erosion, this soil has severe limitations for residential development. Capability unit VIIe-1.

Wheeling Series

The Wheeling series consists of deep, well-drained, nearly level and gently sloping soils on terraces. These soils formed in loamy, acid, stratified Ohio River alluvium. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is brown loam about 9 inches thick. The subsurface layer is yellowish-brown, friable loam about 4 inches thick. The subsoil is about 37 inches thick. The upper 20 inches is strong-brown, firm silty clay loam and clay loam; the next 12 inches is strong-brown, firm sandy clay loam; and the lower 5 inches is friable, brown loam. The underlying material, to a depth of 70 inches, is brown, stratified loam, fine sandy loam, and fine sand that has thin strata of silt loam.

Available water capacity is high in Wheeling soils, and permeability is moderate. The content of organic matter is moderate.

Representative profile of Wheeling loam, 0 to 2 percent slopes, in a cultivated field, 1,170 feet south and 1,050 feet east of the NW. corner of the SW¼ sec. 36, T. 6 S., R. 10 W.:

Ap—0 to 9 inches, brown (10YR 4/3) loam; weak, fine, granular structure; friable; medium acid; abrupt, smooth boundary.

A2—9 to 13 inches, yellowish-brown (10YR 5/4) loam; weak, fine and medium, subangular blocky structure; friable; common mica flakes; medium acid; clear, wavy boundary.

B21t—13 to 25 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm; thin, continuous, brown (7.5YR 4/4) clay films on faces of peds; common mica flakes; medium acid; gradual, wavy boundary.

B22t—25 to 33 inches, strong-brown (7.5YR 5/6) clay loam; moderate, medium, subangular blocky structure; firm; thin, continuous,

Figure 26.—**A typical small woodlot of hardwoods on Wellston silt loam, 25 to 50 percent slopes.**

reddish-brown (5YR 4/4) clay films on faces of peds; common mica flakes; strongly acid; clear, wavy boundary.

B23t—33 to 45 inches, strong-brown (7.5YR 5/6) sandy clay loam; moderate, medium and coarse, subangular blocky structure; firm; thin, discontinuous, reddish-brown (5YR 4/4) clay films on faces of peds; common mica flakes; strongly acid; gradual, wavy boundary.

B3—45 to 50 inches, brown (7.5YR 5/4) loam; weak, coarse, subangular blocky structure; friable; thin, patchy, reddish-brown (5YR 4/4) clay films on faces of peds; common mica flakes, strongly acid; gradual, wavy boundary.

C—50 to 70 inches, brown (7.5YR 5/4) (10YR 5/3) stratified loam, fine sandy loam, and fine sand that has thin strata of silt loam; friable; massive; common mica flakes; strongly acid.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3 or 10YR 4/3) in color. The B21t and B22t horizons are brown (7.5YR 4/4) to yellowish-brown (10YR 5/6) silty clay loam to clay loam or sandy clay loam. The B21t horizon contains enough sand to give it a gritty feel. Profile thickness ranges from 40 to 60 inches.

Wheeling soils are associated with Sciotoville and Weinbach soils. They are better drained and contain more sand in the lower part of the solum than the associated soils. Also, Wheeling soils are unlike the associated soils in that they do not have a fragipan.

Wheeling loam, 0 to 2 percent slopes (WhA).—This soil is on terraces of alluvium. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of moderately well drained Sciotoville soils. Also included are areas where the soil has a silt loam surface layer.

Runoff is slow, and this soil has no serious limitations to use and management. This soil is suited to corn, soybeans, small grain, hay, and pasture.

Limitations for residential development are slight. Capability unit I-1.

Wheeling loam, 2 to 6 percent slopes, eroded (WhB2).—This soil is on long, narrow breaks and ridges on terraces adjacent to drainageways (fig. 27). This soil has a profile similar to that described as representative of the series, but erosion has removed part of the surface layer. In most places the plow layer is a mixture of material from the original surface layer and the upper part of the subsoil.

Included with this soil in mapping are small areas where slopes are short and are more than 6 percent. These areas are on short breaks adjacent to less well drained soils. Also included are areas where the surface layer is silt loam.

Runoff is medium on this soil, and the hazard of erosion is the major limitation in use and management. This soil is suited to corn, soybeans, small grain, hay, and pasture.

Limitations for residential development are slight. Capability unit IIe-3.

Wilbur Series

The Wilbur series consists of deep, moderately well drained, nearly level soils on bottom lands. These soils formed in nonacid loamy alluvium. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is dark-brown silt loam about 9 inches thick. The underlying material, to a depth of 60 inches, is friable silt loam. The upper 16 inches of

this material is brown and yellowish brown, the next 15 inches is light brownish gray, and the lower 20 inches is brown. Mottles are present between depths of 13 and 60 inches.

Available water capacity is high in Wilbur soils, and permeability is moderate. These soils have a seasonal high water table. The content of organic matter is moderate.

Representative profile of Wilbur silt loam in a cultivated field, 280 feet north of center of sec. 6, T. 7 S., R. 11 W.:

Ap—0 to 9 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

C1—9 to 13 inches, brown (10YR 5/3) silt loam; weak, thick, platy structure that parts to weak, medium, granular; friable; slightly acid; clear, wavy boundary.

C2—13 to 20 inches, brown (10YR 5/3) and yellowish-brown (10YR 5/4) silt loam; common, fine, faint, grayish-brown (10YR 5/2) mottles; weak, medium, granular structure; friable; neutral; clear, smooth boundary.

C3—20 to 25 inches, yellowish-brown (10YR 5/4) silt loam; common, fine, distinct, gray (10YR 6/1) mottles; weak, medium, granular structure; friable; neutral; gradual, wavy boundary.

C4g—25 to 40 inches, light brownish-gray (10YR 6/2) silt loam; common, medium, distinct, brown (10YR 5/3) mottles; massive; friable; neutral; gradual, smooth boundary.

C5—40 to 60 inches, brown (10YR 5/3) silt loam; common, fine, distinct, gray (10YR 6/1) mottles; massive; friable; neutral.

The Ap horizon is dark grayish brown (10YR 4/2), dark brown (10YR 4/3), or brown (10YR 5/3). Few to common gray mottles are present in the C2 and C3 horizons. The C1 and C2 horizons are medium acid to neutral. The C5 horizon has strata of sandy loam in places.

Wilbur soils are associated with Lindside, Wakeland, and Birds soils. They have drainage characteristics similar to those of Lindside soils, but they contain less clay than the Lindside soils. Wilbur soils are better drained than Wakeland and Birds soils.

Wilbur silt loam (0 to 2 percent slopes) (Wm).—This soil is on bottom lands along small streams. Included in mapping are small areas of somewhat poorly drained Wakeland soils. Also included are small areas where the soil is underlain by dark-gray silt loam or light silty clay loam at a depth of 25 to 30 inches.

Occasional flooding is the major hazard in use and management of this soil. The soil is suited to most crops commonly grown in the county. Corn, soybeans, hay, and pasture are the main crops.

Because of the hazard of flooding, this soil has severe limitations for residential development. Capability unit I-2.

Woodmere Series

The Woodmere series consists of deep, well-drained, nearly level soils on bottom lands. These soils formed in Ohio River sediment. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is dark-brown silty clay loam about 10 inches thick. The subsoil is about 49 inches thick. The upper 20 inches is dark-brown, firm silty clay loam, and the lower 29 inches is brown, firm silty clay and silty clay loam. The underlying material, to a depth of 82 inches, is strong-brown silty clay loam.

Available water capacity is high in Woodmere soils, and permeability is moderately slow. The content of organic matter is moderate.

Representative profile of Woodmere silty clay loam in a cultivated field, 1,300 feet north and 30 feet east of the SW. corner of sec. 34, T. 7 S., R. 11 W.:

Ap—0 to 10 inches, dark-brown (10YR 4/3) silty clay loam; moderate, medium, granular structure; friable; few mica flakes; neutral; abrupt, smooth boundary.

B2—10 to 30 inches, dark-brown (10YR 4/3) silty clay loam; moderate, medium, subangular blocky structure; firm; few mica flakes; neutral; abrupt, wavy boundary.

IIBb1—30 to 42 inches, brown (7.5YR 4/4) silty clay; weak, medium, prismatic structure that parts to moderate, medium, subangular blocky; firm; common mica flakes; medium acid; clear, wavy boundary.

IIBb2—42 to 59 inches, brown (7.5YR 4/4) silty clay loam; weak, medium, prismatic structure that parts to weak, medium and coarse, subangular blocky; firm; thin, discontinuous, dark-brown (10YR 3/3) clay films on faces of peds; few light brownish-gray (10YR 6/2) coatings; common mica flakes; strongly acid; gradual, wavy boundary.

IIC—59 to 82 inches, strong-brown (7.5YR 5/6) silty clay loam; massive; firm; thin, patchy, brown (7.5YR 4/4) clay films and light brownish-gray (10YR 6/2) coatings on faces of peds; few black (10YR 2/1) manganese concretions; common mica flakes; strongly acid.

The Ap horizon ranges from dark brown (10YR 4/3) to dark yellowish brown (10YR 4/4) in color. The IIBb1 horizon is silty clay to silty clay loam. Depth to the IIBb1 horizon ranges from 28 to 34 inches.

Woodmere soils are associated with Huntington and Lindside soils. They contain more clay and are more strongly acid in the lower part of the B horizon than the associated soils.

Woodmere silty clay loam (0 to 2 percent slopes) (Wo).—This soil is on long narrow areas on bottom lands at a slightly higher elevation than the Huntington and Lindside soils. Included in mapping are small areas of gently sloping soils on breaks that have thinner neutral alluvium overlying older acid material. In some areas a part of the brown acid material is mixed in with the material in the dark-brown Ap horizon. Also included are small areas where the surface layer is heavy silt loam.

Runoff is slow on this soil, and occasional flooding is a hazard in use and management. This soil is suited to corn, soybeans, small grain, hay, and pasture. Alfalfa and small grain are sometimes damaged by flooding in winter and early in spring.

Because of the hazard of flooding, this soil has severe limitations for residential development. Capability unit I-2.

Zanesville Series

The Zanesville series consists of deep, well-drained, moderately sloping and strongly sloping soils on uplands. These soils formed in loess and the underlying material that weathered from sandstone and shale bedrock. A firm and brittle fragipan is at a depth of about 30 inches. The native vegetation is mixed hardwood trees.

In a representative profile the surface layer is dark yellowish-brown silt loam about 6 inches thick. The subsoil is about 44 inches thick. The upper 20 inches is strong-brown, firm light silty clay loam and heavy silt loam, and the lower 24 inches is a fragipan of strong-brown and yellowish-brown, very firm and brittle heavy silt loam and silt loam. The underlying material, to a depth of 60 inches, is yellowish-brown and light yellowish-brown silt loam and silty clay loam.

Available water capacity is moderate in Zanesville soils, and permeability is very slow. The content of organic matter is low.

Representative profile of Zanesville silt loam, 6 to 12 percent slopes, eroded, 660 feet south and 30 feet west of the NE. corner of the NW¼ sec. 26, T. 4 S., R. 10 W.:

Ap—0 to 6 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium, granular structure; friable; strongly acid; abrupt, smooth boundary.

B21t—6 to 14 inches, strong-brown (7.5YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; firm; thin, patchy, reddish-brown (5YR 4/3) clay films on faces of peds; few grayish-brown (10YR 5/2) silt coatings in voids and cracks; very strongly acid; clear, smooth boundary.

Figure 27.—An area of Wheeling loam, 2 to 6 percent slopes, eroded, at high elevation is not flooded, but the Newark, Lindside, and Huntington soils at lower elevations are.

B22t—14 to 26 inches, strong-brown (7.5YR 5/6) heavy silt loam; moderate, medium and coarse, subangular blocky structure; firm; thin, discontinuous, reddish-brown (5YR 4/4) clay films on faces of peds; pale-brown (10YR 6/3) and light-gray (10YR 7/2) silt coatings on faces of peds and in old root channels; very strongly acid; clear, wavy boundary.

Bx1—26 to 34 inches, strong-brown (7.5YR 5/6) and yellowish-brown (10YR 5/4) heavy silt loam; weak, very coarse, prismatic structure that parts to weak, coarse, subangular blocky; very firm and brittle; reddish-brown (5YR 4/4) clay films on faces of prisms and in cracks; thin to thick coatings of gray (10YR 6/1) silt cappings on prisms; light-gray (10YR 7/2) silt coatings in crack fills and old root channels; very strongly acid; gradual, smooth boundary.

IIBx2—34 to 50 inches, yellowish-brown (10YR 5/6) silt loam that contains few weathered sandstone fragments; weak, very coarse, prismatic structure; very firm and brittle; thin, discontinuous, brown (10YR 5/3) clay films on faces of peds; light-gray (10YR 7/1) silt coatings along vertical peds and in cracks; very strongly acid; gradual, diffuse boundary.

IIC—50 to 60 inches, yellowish-brown (10YR 5/6) and light yellowish-brown (10YR 6/4) silt loam and silty clay loam that contains numerous weathered sandstone and shale fragments; massive; friable; common, medium, very dark brown (10YR 2/2) concretions; strongly acid.

The Ap horizon ranges from dark grayish brown to dark yellowish brown in color. In wooded areas an A1 horizon 1 to 3 inches thick that ranges from very dark gray to grayish brown is present. Depth to the fragipan is 23 to 30 inches. The B21t and B22t horizons are heavy silt loam or light silty clay loam. A B1 horizon 3 to 6 inches thick is present in places. Depth to the IIBx2 horizon is 26 to 48 inches.

The Zanesville soils are associated with the Wellston and Hosmer soils. Unlike Wellston soils, Zanesville soils have a fragipan, and they have more sandstone fragments in the lower part of the solum than Hosmer soils.

Zanesville silt loam, 6 to 12 percent slopes, eroded (ZaC2).—This soil is on narrow ridges and side slopes. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of gently sloping soil. Also included are small areas of severely eroded soil.

Runoff is medium on this soil. The hazard of further erosion, the very slowly permeable fragipan, and the moderate available water capacity are limitations in use and management. This soil is suited to most crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops. Because the fragipan restricts downward root growth and movement of water, alfalfa and other deep-rooted crops are not well suited to this soil. In years when rainfall is below average or poorly distributed, crops are subject to damage from drought.

Because of the very slowly permeable fragipan, this soil has severe limitations for residential development unless public sewers are available. Limitations for this use are moderate if public sewers are available. The need for cuts and fills and control of erosion is also a limitation for this use. Capability unit IIIe-7.

Zanesville silt loam, 6 to 12 percent slopes, severely eroded (ZaC3).—This soil is on narrow ridges and side slopes. It has a profile similar to that described as representative of the series, but erosion has removed 4 to 6 inches of the original surface layer. Also, depth to the fragipan in this soil ranges from 20 to 24 inches. Small gullies have cut some areas and exposed the light-gray silt-capped fragipan.

Runoff is rapid on this soil. The hazard of further erosion, the very slowly permeable fragipan, and the moderate available water capacity are limitations in use and management.

This soil is suited to small grain, hay, and pasture. Seedbeds often work up cloddy and provide poor stands. Because the fragipan restricts downward root growth and movement of water, alfalfa and other deep-rooted crops are not well suited to this soil. In years when rainfall is below average or poorly distributed, crops are subject to damage from drought.

Because of the very slowly permeable fragipan, this soil has severe limitations for residential development unless public sewers are available. Limitations for this use are moderate if public sewers are available. The need for cuts and fills and control of erosion during construction is also a limitation for this use. Capability unit IVe-7.

Zanesville silt loam, 12 to 18 percent slopes, eroded (ZaD2).—This soil is on the sides of natural draws. It has a profile similar to that described as representative of the series, but it has a less well-developed fragipan and a thinner surface layer and subsoil. Erosion has removed 3 to 5 inches of the original surface layer. The present surface layer contains a moderate amount of brown subsoil material. Included in mapping are small areas of severely eroded soils.

Runoff is rapid on this soil. The hazard of further erosion, the very slowly permeable fragipan, and the moderate available water capacity are limitations in use and management. This soil is suited to small grain, hay, and pasture. The hazard of further erosion limits the use of this soil for row crops. Because the fragipan restricts the downward root growth and movement of water, alfalfa and other deep-rooted crops are not well suited to this soil. In years when rainfall is below average or poorly distributed, crops are subject to damage from drought.

Because of the very slowly permeable fragipan and slope, this soil has severe limitations for residential development. The need for cuts and fills and control of erosion during construction is also a limitation for this use. Capability unit IVe-7.

Zanesville silt loam, 12 to 18 percent slopes, severely eroded (ZaD3).—This soil is on the sides of natural draws. It has a profile similar to that described as representative of the series, but it has a less well-developed fragipan and is severely eroded. Erosion has removed 5 inches to all of the original surface layer and as much as 4 inches of the subsoil. In most places the present surface layer is a mixture of mostly strong-brown light silty clay loam subsoil material and a moderate amount of the material that remains from the original surface layer. The depth to the fragipan ranges from 15 to 20 inches. Included in mapping are small areas where deep gullies have cut the soil, exposing the light-gray silt-capped fragipan.

Runoff is very rapid on this soil. The hazard of further erosion, the very slowly permeable fragipan, and the moderate available water capacity are limitations in use and management. This soil is suited to hay and pasture. The hazard of further erosion limits the use of this soil for row crops. Because the fragipan restricts the downward growth of roots and movement of water, alfalfa and other deep-rooted crops are not well suited to this soil. In years when rainfall is below average or poorly distributed, crops are subject to damage from drought.

Because of the very slowly permeable fragipan and slope, this soil has severe limitations for residential development. The need for cuts and fills and control of erosion during construction is also a limitation for this use. Capability unit VIe-1.

Zipp Series

The Zipp series consists of deep, very poorly drained, nearly level soils on terraces. These soils formed in clayey lacustrine sediment. The native vegetation is grasses, sedges, and swamp forest.

In a representative profile the surface layer is dark-gray silty clay about 6 inches thick. The subsoil is mottled, dark-gray and gray, firm silty clay about 37 inches thick. The underlying material, to a depth of 60 inches, is gray and light olive-brown silty clay.

Available water capacity is high in Zipp soils, and permeability is very slow. The content of organic matter is moderate. These soils have a seasonal high water table.

Representative profile of Zipp silty clay, 85 feet west and 110 feet south of the NE. corner of sec. 2, T. 6 S., R. 10 W.:

Ap—0 to 6 inches, dark-gray (10YR 4/1) silty clay; moderate, medium, granular structure; firm; neutral; abrupt, smooth boundary.

B21g—6 to 13 inches, dark-gray (10YR 4/1) silty clay; common, fine, distinct, light olive-brown (2.5Y 5/4) mottles; moderate, medium, subangular and angular blocky structure; firm; neutral; clear, smooth boundary.

B22g—13 to 25 inches, dark-gray (5Y 4/1) silty clay; many, fine, distinct, light olive-brown (2.5Y 5/4) mottles; moderate, medium and coarse, prismatic structure that parts to moderate, medium, angular blocky; firm; thin, discontinuous, gray (N 5/0) clay films or pressure faces; neutral; gradual, wavy boundary.

B23g—25 to 43 inches, gray (5Y 5/1) silty clay; many, fine, faint, olive-gray (5Y 5/2) and common, fine, distinct, olive (5Y 5/4) mottles; weak, coarse, angular blocky; firm; thin, discontinuous, gray (N 5/0) clay films or pressure faces on faces of peds; neutral; gradual, wavy boundary.

Cg—43 to 60 inches, gray (10YR 6/1) and light olive-brown (2.5Y 5/6) silty clay; massive; firm; mildly alkaline.

The Ap horizon ranges from dark gray (10YR 4/1) to grayish brown (10YR 5/2) in color. The B2 horizon is heavy silty clay loam to clay. Reaction is slightly acid or neutral.

Zipp soils are associated with Ragsdale and Patton soils. They are more clayey and have a lighter colored A horizon than the associated soils.

Zipp silty clay (0 to 2 percent slopes) (Zp).—This soil is in large areas on lakebed terraces. Included in mapping are small areas of soil that has less clay throughout the profile than this soil. Also included are small areas in the vicinity of Ponds Flat Ditch that have 6 to 13 inches of silt loam overwash deposited on top of the surface layer.

Runoff is very slow or ponded on this soil (fig. 28). Wetness is the major limitation, and maintenance of good tilth is a concern in use and management. The soil becomes cloddy if plowed when too wet or too dry, and, as a result, seedbeds are difficult to prepare. If a suitable drainage system is established and maintained, this soil is suited to all crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops.

Because of a seasonal high water table, surface ponding, and very slow permeability, this soil has severe limitations for residential development. Capability unit IIIw-2.

Use and Management of the Soils

This section provides information on use and management of the soils in Vanderburgh County for cultivated crops and pasture, woodland, wildlife habitat, recreation, and engineering projects. The system of capability classification used by the Soil Conservation Service is explained, predicted average yields for important crops in the county are given, and planning for town and country development is discussed.

Figure 28.—Surface water standing on a field of Zipp silty clay.

The information presented is mostly of a general nature in that it does not apply to specific sites. More specific detailed information can be obtained from the local conservationist of the Soil Conservation Service or from the Vanderburgh Cooperative Extension Service.

Use of the Soils for Crops

About 52 percent of the acreage of Vanderburgh County is used for crops and pasture. The main crops are corn, soybeans, small grain, grain sorghum, and grass and legumes for forage.

Some of the major management concerns in this county are soils that have a fragipan, wetness, soil blowing and water erosion, maintenance of fertility and organic-matter content, and maintenance or improvement of tilth. Of the intensively cultivated acreage, about 20 percent is limited for use by wetness and 60 percent by the hazard of erosion. Only 12 percent of the acreage has few limitations for growth of crops.

The major management practices are installing suitable tile drainage systems, grassing waterways, contour farming, diversion terracing, grade stabilizing, minimum tillage, use of crop residues, green-manure crops, and winter cover crops; and, for most of these soils, applying lime and fertilizer in amounts indicated by tests and field trials. A system of periodic liming should be followed for Bonnie, Ginat, Hosmer, Markland, Sciotoville, Stendal, Wellston, and Zanesville soils.

On the pages that follow, the system of capability grouping used by the Soil Conservation Service is discussed, the soils in each capability unit are described, and management suited to the soils in each unit is suggested. Predicted yields of the principal crops are given for all the soils in the country in table 2.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are so used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for town and country planning, for forest trees, or engineering.

In the capability system (*11*), the kinds of soils are grouped at three levels: the capability class, subclass, and unit. These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife.

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, water supply, or to esthetic purposes. (No class VIII soils are in Vanderburgh County.)

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in some parts of the United States but not in Vanderburgh County, shows that the chief limitation is climate that is too cold to too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, although they

TABLE 2.—*Predicted average acre yields of specified crops under a high level of management*

[The land types Borrow pits (Br), Gullied land (Bu), and Made land (Ma) require onsite investigation and are not listed]

Soils	Corn	Wheat	Soybeans	Legume-grass hay	Tall-fescue pasture
	Bu	Bu	Bu	Tons	AUM[1]
Alford silt loam, 2 to 6 percent slopes, eroded	120	48	42	4.0	8.0
Alford silt loam, 6 to 12 percent slopes, eroded	110	44	38	3.6	7.2
Alford silt loam, 6 to 12 percent slopes, severely eroded	105	42	37	3.4	6.8
Alford silt loam, 12 to 18 percent slopes, severely eroded	90	36	32	3.0	6.0
Bartle silt loam	110	50	38	3.6	7.2
Birds silt loam	135	54	47	4.4	8.8
Bonnie silt loam	130	52	46	4.3	8.6
Evansville silt loam	155	62	54	5.1	10.2
Ginat silt loam	115	46	40	3.8	7.6
Henshaw silt loam	135	54	47	4.4	8.8
Hosmer silt loam, 0 to 2 percent slopes	105	47	37	3.4	6.8
Hosmer silt loam, 2 to 6 percent slopes, eroded	95	43	33	3.1	6.2
Hosmer silt loam, 2 to 6 percent slopes, severely eroded	85	38	30	2.8	5.6
Hosmer silt loam, 6 to 12 percent slopes, eroded	85	38	30	2.8	5.6
Hosmer silt loam, 6 to 12 percent slopes, severely eroded	75	34	26	2.5	5.0
Hosmer silt loam, 12 to 18 percent slopes, severely eroded	60	27	21	2.0	4.0
Huntington silty clay loam	135	54	47	4.4	4.8
Huntington fine sandy loam, sandy variant	115	46	40	3.8	7.6
Iona silt loam, 0 to 2 percent slopes	125	50	44	4.1	8.2
Iona silt loam, 2 to 6 percent slopes, eroded	120	48	42	4.0	8.0
Iva silt loam	135	54	47	4.4	8.8
Lindside silty clay loam	130	52	46	4.3	8.6
Markland silt loam, 2 to 6 percent slopes, eroded	80	36	28	2.2	4.4
Markland silt loam, 6 to 18 percent slopes, eroded	70	32	24	2.3	4.6
Markland silty clay loam, 6 to 18 percent slopes, severely eroded	60	27	21	2.0	4.0
McGary silt loam	100	45	35	3.3	6.6
Muren silt loam, 0 to 2 percent slopes	125	50	44	4.1	8.2
Muren silt loam, 2 to 6 percent slopes, eroded	120	48	42	4.0	8.0
Newark silty clay loam	135	54	47	4.4	8.8
Patton silty clay loam	155	62	54	5.1	10.2
Princeton fine sandy loam, 2 to 6 percent slopes	105	47	37	3.4	6.8
Ragsdale silt loam	155	62	54	5.1	10.2
Rahm silty clay loam	135	54	47	4.4	8.8
Reesville silt loam	135	54	47	4.4	8.8
Sciotoville silt loam, 0 to 2 percent slopes	100	45	35	3.3	6.6
Sciotoville silt loam, 2 to 6 percent slopes, eroded	90	40	32	3.0	6.0
Stendal silt loam	130	52	46	4.3	8.6
Uniontown silt loam, 2 to 6 percent slopes, eroded	115	46	40	3.8	7.6
Wakeland silt loam	135	54	47	4.4	8.8
Weinbach silt loam	110	50	38	3.6	7.2
Wellston silt loam, 12 to 18 percent slopes, eroded	80	32	28	2.6	5.2
Wellston silt loam, 12 to 18 percent slopes, severely eroded	75	30	26	2.5	5.0
Wellston silt loam, 18 to 25 percent slopes, eroded	65	26	23	2.1	4.2
Wellston silt loam, 25 to 50 percent slopes	45	18	16	1.5	3.0
Wheeling loam, 0 to 2 percent slopes	105	42	37	3.4	6.8
Wheeling loam, 2 to 6 percent slopes, eroded	100	40	35	3.3	6.6
Wilbur silt loam	125	50	44	4.1	8.2
Woodmere silty clay loam	125	50	44	4.1	8.2
Zanesville silt loam, 6 to 12 percent slopes, eroded	85	38	30	2.8	5.6
Zanesville silt loam, 6 to 12 percent slopes, severely eroded	75	34	26	2.5	5.0
Zanesville silt loam, 12 to 18 percent slopes, eroded	60	27	21	2.0	4.0
Zanesville silt loam, 12 to 18 percent slopes, severely eroded	50	22	18	1.6	3.2
Zipp silty clay	105	47	37	3.4	6.8

[1]AUM stands for animal-unit-months, which is a term used to express the carrying capacity of pasture. It is the number of animals carried per acre multiplied by the number of months the pasture can be grazed during a single grazing season without injury to the sod. For example, an acre of pasture that provides two months of grazing for 5 cows has a carrying capacity of 10 animal-unit-months.

have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIw-1 or IIIe-7. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the

Arabic numeral specifically identifies the capability unit within each subclass.

In the following paragraphs the capability units in Vanderburgh County are described and suggestions for the use and management of the soils are given. To find the capability unit of a specific soil, refer to the soil itself in the section "Descriptions of the Soils" or to the "Guide to Mapping Units" at the back of this publication.

CAPABILITY UNIT I-1

This unit consists of deep, well drained to moderately well drained, nearly level soils of the Iona, Muren, and Wheeling series. These soils are on uplands and terraces. The surface layer of these soils is medium textured.

Content of organic matter is moderate in Iona and Wheeling soils and low in Muren soils. Available water capacity is high. Permeability is moderate except in Iona and Muren soils, which are moderately slowly permeable.

The soils in this unit are suited to all crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops.

These soils present no serious hazards in use and management. The main management needs are maintaining organic-matter content and fertility and maintaining and improving tilth. Using crop residue, minimum tillage, and green-manure crops helps to improve and maintain a favorable level of organic-matter content and tilth.

CAPABILITY UNIT I-2

This unit consists of deep, well drained to moderately well drained, nearly level soils of the Huntington, Huntington, sandy variant, Lindside, Wilbur, and Woodmere series. These soils are on bottom lands along the Ohio River and its tributaries. The surface layer and subsoil or underlying material of soils in this unit are moderately coarse to moderately fine textured.

Content of organic matter is moderate in soils of this unit. Permeability is moderate or moderately slow, except in Huntington, sandy variant, soils, which are moderately rapidly permeable. Available water capacity is high. Occasional flooding, mostly in winter and early in spring, is a hazard in use and management (fig. 29). Huntington, sandy variant, soils are somewhat droughty.

The soils in this unit are suited to most crops commonly grown in the county. Corn, soybeans, grain sorghum, and hay are the main crops. Alfalfa and small grains are severely damaged during periods of prolonged flooding. Dikes and levees help to prevent flooding. If dry periods are prolonged, drought damage is likely to occur on the Huntington, sandy variant, soils.

Using crops residue and green-manure crops helps to improve and maintain a favorable level of organic-matter content. Crops respond well to proper applications of fertilizer.

CAPABILITY UNIT IIe-3

This unit consists of deep, well drained and moderately well drained, gently sloping soils of the Alford, Iona, Muren, Uniontown, and Wheeling series. These soils are on uplands and terraces. The surface layer of these soils is medium textured.

Content of organic matter and natural fertility are low to moderate in soils of this unit. Available water capacity is high. Permeability is moderate in Alford and Wheeling soils and moderately slow in Iona, Muren, and Uniontown soils. Runoff and erosion are hazards in use and management.

The soils in this unit are suited to all crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops.

The main management needs are maintaining organic-matter content and fertility, improving and maintaining tilth, and controlling erosion.

Using crop residue, medium tillage, and green-manure crops helps to improve and maintain a favorable level of organic-matter content and good tilth. These practices, along with terracing, contour cultivation, and use of grassed waterways, help to control runoff and erosion.

CAPABILITY UNIT IIe-7

This unit consists of deep, moderately well drained and well drained, gently sloping soils of the Hosmer and Sciotoville series. These soils have a surface layer of medium texture and a subsoil of moderately fine texture. A very firm and brittle fragipan is at a depth of about 22 to 32 inches.

Content of organic matter and natural fertility are low to moderate in the soils of this unit. The fragipan is very slowly permeable. It restricts the downward growth of roots and movement of water and limits the available water capacity to moderate. Runoff and erosion are hazards in use and management.

The soils in this unit are suited to most crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops. Because the fragipan restricts root growth and water penetration, alfalfa and other deep-rooted crops are not well suited to this soil. In years when rainfall is below average or poorly distributed, crops are subject to damage from drought. Wetness early in spring, caused by perching of water above the fragipan, often delays farming operations.

The main management needs are maintaining organic-matter content and fertility, maintaining and improving tilth, and controlling erosion. Using crop residue, minimum tillage, and green-manure crops helps to maintain and improve organic-matter content and tilth. These practices, along with terracing, contour cultivation, and grassed waterways, help to control runoff and erosion.

CAPABILITY UNIT IIe-11

Princeton fine sandy loam, 2 to 6 percent slopes, is the only soil in this unit. It is a deep, well-drained, gently sloping soil. The surface layer is moderately coarse textured, and the subsoil is medium textured or moderately fine textured.

Content of organic matter is moderate in the soils of this unit. Available water capacity and permeability are moderate. Erosion is a hazard, and the moderate available water capacity is a limitation in use and management. In years when rainfall is below average or poorly distributed, crops are subject to damage from drought.

This soil is suited to all crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops. Alfalfa and orchards are also well suited to this soil.

The main management needs are maintaining organic-matter content and fertility and controlling erosion. Using crop residue, minimum tillage, and green-manure crops helps to improve and maintain organic-matter content and tilth. These practices, along with contour cultivation, terracing, and grassed waterways, help to control erosion.

CAPABILITY UNIT IIw-1

This unit consists of deep, poorly drained and very poorly drained, nearly level soils of the Evansville, Patton, and

Figure 29.—**Aftermath of winter flooding on Huntington and Lindside soils. Flooding does not occur on the Wheeling soils (upper right).**

Ragsdale series. These soils are in depressions on nearly level terraces and uplands. The surface layer of these soils is medium textured to moderately fine textured.

Content of organic matter is moderate to high in the soils of this unit. Available water capacity is high, and permeability is moderate to slow. Wetness is the main limitation in use and management. Maintenance of good tilth is a concern when managing the moderately fine textured soils.

If a suitable drainage system is established and maintained, the soils in this unit are suited to all crops commonly grown in the county. Alfalfa is subject to frost heaving in winter and early in spring. Using crop residue and minimum tillage and working the moderately fine textured soils at a favorable moisture content help to maintain good tilth.

CAPABILITY UNIT IIw-2

This unit consists of deep, somewhat poorly drained, nearly level soils of the Iva, Henshaw, and Reesville series. These soils are on uplands and terraces. The surface layer of these soils is medium textured.

Content of organic matter and natural fertility are low to moderate in the soils of this unit. Available water capacity is high. Permeability ranges from moderately slow to slow. Wetness is the main limitation in use and management.

The main management needs are maintaining organic-matter content and fertility and improving and maintaining tilth and drainage.

If a suitable drainage system is established and maintained, the soils in this unit are suited to all crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops.

Using crop residue, minimum tillage, and green-manure crops helps to maintain and improve a favorable level of organic-matter content and to maintain and improve tilth.

CAPABILITY UNIT IIw-3

This unit consists of deep, nearly level soils of the Bartle and Weinbach series. These soils are on terraces.

Content of organic matter is low to moderate in the soils of this unit, and natural fertility is low. Available water capacity is moderate, and permeability is very slow. Wetness is the main limitation in use and management.

The main management needs are maintaining organic-matter content and fertility, improving and maintaining tilth, providing adequate drainage, and controlling erosion on the gentle slopes.

If a suitable drainage system is established and maintained, the soils in this unit are suited to most crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops. Because the very slowly permeable fragipan restricts downward growth of roots and movement of water, alfalfa and other deep-rooted crops are not well suited to these soils.

Using crop residue, minimum tillage, and green-manure crops helps to maintain and improve a favorable level of organic-matter content and helps to maintain and improve good tilth.

CAPABILITY UNIT IIw-5

This unit consists of deep, well drained and moderately well drained, nearly level soils of the Hosmer and Sciotoville series. These soils are on uplands and terraces. Their surface layer is medium textured, and the subsoil is medium textured and moderately fine textured.

Content of organic matter and natural fertility are low to moderate in the soils of this unit. A very slowly permeable fragipan is at a depth of 22 to 34 inches. This pan restricts downward movement of water and roots and limits the available water capacity to moderate. Wetness caused by perching of water above the fragipan often delays farming early in spring.

The soils in this unit are suited to most crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops. Because the fragipan restricts downward root growth and water movement, alfalfa and other deep-rooted crops are not well suited to this soil.

The main management needs are maintenance of organic-matter content and fertility, and improvement and maintenance of tilth. In years when rainfall is below average or poorly distributed, crops are subject to damage from drought. Using crop residue, minimum tillage, and green-manure crops helps to maintain and improve a favorable level of organic-matter content and helps to maintain and improve good tilth.

CAPABILITY UNIT IIw-7

This unit consists of deep, somewhat poorly drained, nearly level soils of the Newark, Rahm, Stendal, and Wakeland series. These soils are on bottom lands along the Ohio River and its tributaries. The surface layer of these soils is moderately fine textured or medium textured.

Content of organic matter is low to moderate in soils of this unit. Available water capacity is high. Permeability is moderate except in Newark and Rahm soils, where it is moderately slow. Flooding and wetness are the major hazards in use and management.

If a suitable drainage system is established and maintained, the soils in this unit are suited to corn, soybeans, hay, and pasture. Small grain and alfalfa are subject to severe damage during periods of prolonged flooding. Using crop residue, minimum tillage, and green-manure crops helps to maintain and improve a favorable level of organic-matter content and helps to maintain and improve tilth.

CAPABILITY UNIT IIIe-3

Alford silt loam, 6 to 12 percent slopes, eroded, is the only soil in this unit. This is a deep, well-drained soil on uplands. The surface layer of this soil is medium textured, and the subsoil is moderately fine textured.

Content of organic matter and natural fertility are low in this soil. Available water capacity is high, and permeability is moderate. Erosion and runoff are the major hazards in the use and management of the soil in this unit.

The soil in this unit is suited to all crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops.

The main management needs are control of erosion, maintenance of organic-matter content and fertility, and maintenance and improvement of tilth. Using crop residue, minimum tillage, and green-manure crops helps to reduce erosion, maintain and increase the level of organic-matter content, and improve tilth. Contour cultivation, diversions, waterways, and terraces also help to reduce runoff and control erosion.

CAPABILITY UNIT IIIe-7

This unit consists of deep, well-drained, gently sloping and moderately sloping soils of the Hosmer and Zanesville series. These soils are on uplands. The surface layer of these soils is medium textured, and the subsoil is moderately fine textured.

Content of organic matter and natural fertility are low in soils of this unit. A fragipan is at a depth of 22 to 32 inches. This pan restricts the downward movement of water and growth of roots, and it limits the available water capacity to moderate and the permeability to very slow. Runoff and erosion are hazards in use and management.

The soils in this unit are suited to most crops commonly grown in the county. Corn, soybeans, small grains, hay, and pasture plants are the main crops. Because the fragipan restricts downward root growth and water penetration, alfalfa and other deep-rooted crops are not well suited to soils of this unit. In years when rainfall is below average or poorly distributed, crops are subject to damage from drought.

The main management needs are maintaining good tilth and controlling erosion. Keeping tillage to a minimum and returning crop residue to the soil help to maintain tilth and a favorable content of organic matter. These practices, along with terracing, contour cultivation, and use of diversions and waterways, help to control runoff and erosion (fig. 30).

Figure 30.—**Waterway and concrete block structure on Hosmer silt loam, 6 to 12 percent slopes, eroded, remove runoff safely and help to control erosion.**

CAPABILITY UNIT IIIe-11

Markland silt loam, 2 to 6 percent slopes, eroded, is the only soil in this unit. This is a deep, well-drained soil that has a medium-textured surface layer and a moderately fine textured and fine textured subsoil. This soil is on lacustrine terraces.

Content of organic matter is moderate in the soil of this unit. Permeability is slow, and available water capacity is high. Runoff and erosion are hazards on this soil, and the

***Figure 31.*—An area of Markland silt loam, 2 to 6 percent slopes, eroded, adjacent to the Wakeland soils that formed in alluvium at lower elevations.**

slowly permeable subsoil is a limitation in use and management.

The soil in this unit is suited to all crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops.

The main management needs are maintaining organic matter and fertility, improving and maintaining tilth, and controlling erosion. Using crop residue, minimum tillage, and green-manure crops helps to maintain and improve a favorable level of organic-matter content and helps to maintain and improve tilth (fig. 31). These practices, along with terracing, contouring, and grassed waterways, help to control erosion and runoff.

CAPABILITY UNIT IIIw-2

Zipp silty clay is the only soil in this unit. It is a deep, very poorly drained, nearly level soil on terraces. The surface layer and subsoil of this soil are fine textured.

Content of organic matter is moderate in this soil. Available water capacity is high, and permeability is very slow. Wetness and surface ponding on this soil are the major limitations in use and management.

If a suitable drainage system is established and maintained, this soil is suited to corn, soybeans, hay, and pasture. Alfalfa and small grain are subject to severe damage from flooding or ponding in winter and in spring.

Using crop residue and minimum tillage and working the soil at a favorable moisture content help to maintain tilth (fig. 32).

CAPABILITY UNIT IIIw-6

McGary silt loam is the only soil in this unit. This is a deep, somewhat poorly drained, nearly level soil on terraces. The surface layer of this soil is medium textured, and the subsoil is moderately fine textured.

Content of organic matter and natural fertility are low in this soil. Available water capacity is moderate, and permeability is slow. Wetness and the slowly permeable subsoil are the major limitations in use and management.

If an adequate drainage system is established and maintained, the soil in this unit is suited to all crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops.

Using crop residue, minimum tillage, and green-manure crops helps to maintain and improve a favorable level of organic-matter content and helps to maintain and improve good tilth.

CAPABILITY UNIT IIIw-10

This unit consists of deep, poorly drained, medium-textured soils of the Birds and Bonnie series. These soils are in slight depressions on bottom lands.

Figure 32.—**A recently plowed surface layer of Zipp silty clay. Fall plowing and freezing and thawing in winter help to create a friable seedbed for planting of crops in spring.**

Content of organic matter and natural fertility are low in the soils of this unit. Available water capacity is high, and permeability is slow. Wetness is a limitation, and flooding is a hazard in use and management.

If a suitable drainage system is established and maintained, the soils in this unit are suited to corn, soybeans, hay, and pasture. Small grain and alfalfa are subject to severe damage during periods of flooding.

The main management needs are improving and maintaining organic-matter content and fertility, improving and maintaining tilth, and establishing adequate drainage. Using crop residue, minimum tillage, and green-manure crops helps to maintain and improve a favorable level of organic-matter content and helps to maintain and improve good tilth.

CAPABILITY UNIT IIIw-12

Ginat silt loam is the only soil in this unit. This deep, poorly drained, medium-textured, nearly level soil is on terraces.

Content of organic matter and natural fertility are low in this soil. Available water capacity is moderate, and permeability is very slow. Wetness (fig. 33) and the very slowly permeable subsoil are the major limitations in use and management of this soil.

If a suitable drainage system is established and maintained, the soil in this unit is suited to most crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops. Because the very slowly permeable subsoil restricts rooting depth, alfalfa and other deep-rooted crops are not well suited to this soil.

The main management needs are improving and maintaining organic-matter content, fertility, and tilth and establishing and maintaining adequate drainage. Using crop residue, minimum tillage, and green-manure crops helps to maintain and improve a favorable level of organic-matter content and helps to maintain and improve good tilth.

CAPABILITY UNIT IVe-3

This unit consists of deep, well-drained, moderately sloping and strongly sloping soils of the Alford and Wellston series. These soils are on uplands. The surface layer of these soils is medium textured, and the subsoil is moderately fine textured. The moderately sloping soils are severely eroded.

Content of organic matter and natural fertility are low to moderate in the soils in this unit. Available water capacity is high, and permeability is moderate. Runoff and erosion are the major hazards in use and management.

The soils in this unit are suited to small grain, hay, and pasture. Also, they are well suited to orchards. The severe hazard of erosion limits the use of these soils for row crops.

The main management needs are maintaining and improving organic-matter content and fertility, maintaining tilth, and controlling erosion. Using crop residue and minimum tillage helps to maintain a favorable level of organic-matter content and helps to maintain tilth. These practices, along with terracing (where slopes are less than 12 percent), contouring, stripcropping, and growing grass on waterways, help to control erosion and runoff.

CAPABILITY UNIT IVe-7

This unit consists of deep, well-drained, moderately sloping and strongly sloping soils of the Hosmer and Zanesville series. These soils are on uplands. The surface layer is medium textured, and the subsoil is moderately fine textured. The moderately sloping soils are severely eroded.

Content of organic matter and natural fertility are low in these soils. A very slowly permeable fragipan is at a depth of 22 to 32 inches. This pan restricts the downward movement of water and growth of roots, and it limits the available water capacity to moderate and permeability to very slow. Runoff and erosion are hazards in use and management.

These soils are better suited to small grain, hay, and pasture than to most other uses. The severe hazard of erosion limits the use of these soils for row crops. Because the fragipan restricts root growth and water penetration, alfalfa and other deep-rooted crops are not well suited to these soils. In years when rainfall is below average or poorly distributed, crops are subject to damage from drought.

The main management needs are maintaining tilth and controlling erosion. Using crop residue and minimum tillage helps to maintain a favorable level of organic-matter content and tilth. These practices, along with terracing (fig. 34), contouring, stripcropping, and growing grass on waterways, help to control runoff and erosion.

CAPABILITY UNIT IVe-11

Markland silt loam, 6 to 18 percent slopes, eroded, is the only soil in this unit. This is a deep, well-drained, moderately sloping and strongly sloping soil on terraces. The surface layer is medium textured, and the subsoil is moderately fine textured and fine textured.

Content of organic matter is moderate in this soil. Available water capacity is high, and permeability is slow. Runoff and erosion are hazards, and the slowly permeable subsoil is a major limitation in use and management.

This soil is suited to most crops commonly grown in the county. Corn, soybeans, small grain, hay, and pasture are the main crops. The severe hazard of further erosion limits the use of this soil for row crops.

The main management needs are maintaining organic-matter content and fertility, improving and maintaining tilth, and controlling erosion. Using crop residue and

Figure 33.—**Inadequate drainage threatens these soybeans on Ginat silt loam.**

minimum tillage helps to maintain and improve a favorable level of organic-matter content and helps to maintain and improve good tilth. These practices, along with contour cultivation and grassed waterways, help to control runoff and erosion.

CAPABILITY UNIT VIe-1

This unit consists of deep, well-drained, sloping to moderately steep soils of the Alford, Hosmer, Markland, Wellston, and Zanesville series. These soils are on uplands. The surface layer of these soils is medium textured, and the subsoil is moderately fine textured to fine textured.

Content of organic matter and natural fertility are low to moderate in the soils in this unit. Available water capacity is moderate to high. Permeability is slow or very slow except in Alford and Wellston soils, which are moderately permeable. Hosmer and Zanesville soils have a very slowly permeable fragipan at a depth of about 2 feet. This pan restricts the downward movement of water, air, and roots. Because of the clayey subsoil, permeability is slow in Markland soils. Runoff and erosion are the major hazards in the use and management of the soils in this unit. In years when rainfall is below average or poorly distributed, Hosmer and Zanesville soils are subject to crop damage from drought.

The gently sloping soils in this unit are suited to pasture and hay, but the steeper soils are better suited to trees.

The main management needs are improving and maintaining organic-matter content and fertility and controlling erosion on these soils used for hay and pasture. A permanent vegetative cover helps to control erosion and runoff. In establishing hay or permanent pasture, contour cultivation helps to control erosion. Protection from overgrazing is needed to help control the severe hazard of erosion.

Alfalfa and other deep-rooted crops are not well suited to the soils in this unit that have a fragipan.

CAPABILITY UNIT VIIe-1

Wellston silt loam, 25 to 50 percent slopes, is the only soil in this unit. This is a deep, well-drained soil on uplands. The surface layer of this soil is medium textured.

Content of organic matter and natural fertility are low. Available water capacity is high, and permeability is moderate.

Erosion and runoff are the major hazards in use and management of this soil. The soil is too steep for cultivated crops and is better suited to stands of trees than to most other uses. Permanent pasture can be grown on the gentler sloping soils, but careful management is needed to prevent overgrazing.

CAPABILITY UNIT VIIe-3

This unit consists of Borrow pits and Made land. Some pits are dry, and some contain water. Borrow pits consist mostly of excavated areas where soil material has been removed and has been used mainly as road fill.

Made land consists of areas that have been severely altered by man. Most of these areas are former borrow areas and deep depressions that have been filled with cinders, solid waste, and other rubble and have been leveled. Included are

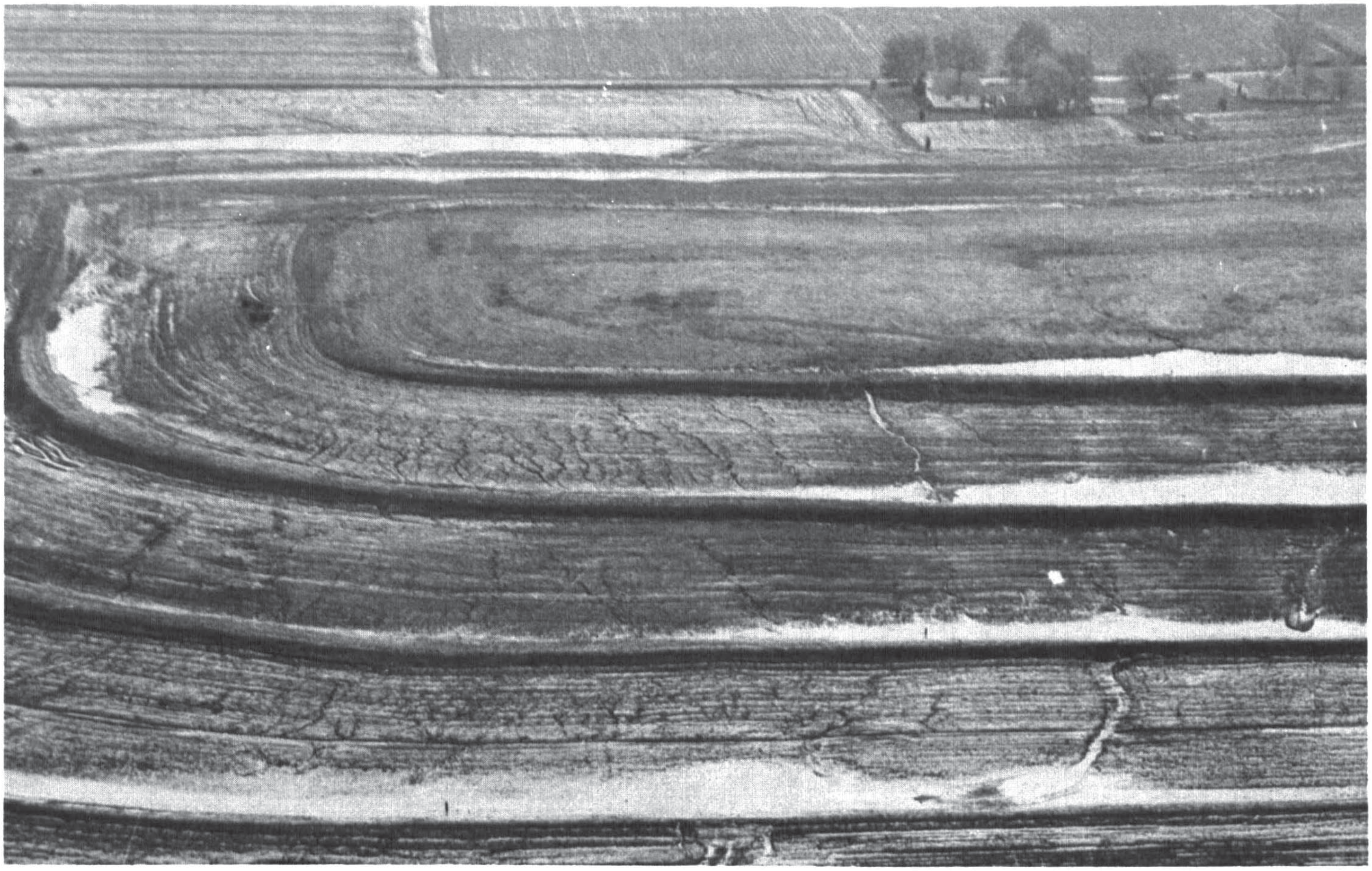

Figure 34.—**A parallel-tile outlet terrace on Hosmer silt loam, 6 to 12 percent slopes, severely eroded, is effective in helping to control runoff.**

areas of sanitary landfill that also have been covered by soil material and leveled. Also included are areas that have been covered by deposits of various types of rubble.

Runoff and erosion are the main hazards in use and management of these land types. Borrow pits that contain water have good potential for wildlife habitat and recreation. Areas that are not too steep or that have been leveled are suited to pasture. Steeper areas are suited to trees. Most of the Made land is now in urban areas and is used mostly for parks, building sites, and recreational areas.

CAPABILITY UNIT VIIe-4

Only the land type Gullied land is in this unit. Bedrock is at a depth of 4 to 8 feet in this land type, and in many places it is exposed at the bottoms of gullies.

Natural fertility and content of organic matter are very low in Gullied land. The hazard of erosion is severe.

Most areas of Gullied land have been abandoned, but shrubs, weeds, and native grasses have begun to grow in most of these abandoned areas. In some areas of Gullied land trees have been planted, and in other areas trees are growing because of natural regeneration. This land type is suited to grasses, trees, and shrubs, all of which help to stabilize the soil material, control runoff, and provide a cover for wildlife.

Predicted yields

Table 2 (page 40) shows, for each soil in the county, the average yields per acre of the principal crops for an improved high level of management.

The following are assumed to be part of a high-level management system:

1. Using cropping systems that maintain tilth and organic-matter content.
2. Controlling erosion to the maximum extent feasible, so that the quality of the soil is maintained or improved rather than reduced.
3. Maintaining a high level of fertility by means of frequent soil tests and use of fertilizer in accordance with recommendations of the State Agricultural Experiment Station.
4. Liming the soils in accordance with the results of soil tests.
5. Using crop residue to the fullest extent practicable to protect and improve the soil.
6. Following minimum tillage practices where needed because of the hazards of soil compaction and erosion.
7. Using only the crop varieties that are best adapted to the climate and to the soil.
8. Controlling weeds carefully by tillage and spraying.
9. Draining wet areas enough to prevent wetness from restricting yields of adapted crops.

The yields shown in table 2 are predicted averages for a period of 5 to 10 years. They are based on farm records, on interviews with farmers and members of the staff of the Purdue University Agricultural Experiment Station, and on direct observations by soil scientists and soil conservationists. Considered in making the predictions were the

prevailing climate, the characteristics of the soils, and the influence of a high level of management of the soils.

It should be understood that these yield figures are not intended to apply directly to specific tracts of land for any particular year, because the soils vary somewhat from place to place, management practices differ from farm to farm, and weather conditions vary from year to year. Nevertheless, these predictions are probably as accurate a guide as can be obtained without detailed and lengthy investigation. They are useful in showing the relative productivity of soils under a high level of management.

Woodland[2]

This section provides information on types of trees or shrubs growing in various soils of the county, desirable species to keep, and species suitable for planting for special uses.

At one time Vanderburgh County was almost completely covered with high-quality hardwood trees. According to the Indiana Soil and Water Conservation Needs Inventory *(3)*, approximately 19,000 acres, or about 12 percent of the county, was woodland in 1967. Many of the wooded areas are small in size and widely scattered, and many are used for urban residential development. Much of the abandoned cropland and pasture is returning to woodland by natural regeneration and tree planting (fig. 35).

To develop an attractive and healthy environment, most of the present woodland needs to be retained and added to by well-planned establishment of additional trees through planting of species adapted to soil conditions.

Tree-covered tracts in the county need to be evaluated for their benefit to the community as well as for their value as producers of wood crops. These areas have long-time value for the following:

Wind protection. Scattered trees and wooded tracts tend to break up wind patterns and reduce wind velocity.

Wildlife. Islands of woody cover are needed for the existence and reproduction of songbirds and all forms of wildlife.

Erosion control. A cover of trees is an excellent protection against erosion, and in many locations it serves as a filter strip for the streams and reservoirs of the county.

Recreation and education. Trees enhance the value of sites for county parks, outdoor laboratories for schools, and nature areas.

Noise reduction. Research findings demonstrate that the presence of wooded areas lowers the sound level around airports and in areas of heavy industry and other areas where noise is excessive.

Air pollution. Trees release moisture and oxygen into the atmosphere to provide a cooling and purifying action. Their role in reducing air pollution is recognized more and more.

Scenic beauty. Wooded tracts enhance the beauty of the landscape and help to make communities more interesting and more desirable places in which to live.

In table 3 the soils of Vanderburgh County have been placed in four broad groups to give land users a basis for planning and managing woodland resources. In this table a listing is made of the trees and shrubs that grow naturally in soils of each of the four soil groups and that should be retained when developing an area for more intensive use as population increases. It also lists many trees and shrubs that are suitable for planting for a wide variety of environmental improvement projects. To determine which group a specific soil is in, refer to the Guide to Mapping Units at the back of this survey.

Table 3 does not list all the plants that grow in or that are suitable for planting in the various soils. Assistance in arranging plants, in determining other plant materials suited to various sites, and in locating sources of plants can be obtained from local landscape architects, commercial nurseries, or forestry specialists.

[2]By JOHN HOLWAGER, woodland conservationist, Soil Conservation Service.

Wildlife

In table 4 the soils of Vanderburgh County are evaluated according to their relative suitability for wildlife habitat. The evaluations or ratings are predictions of the behavior of each soil for such use.

The interpretative information should prove helpful to those responsible for management of wildlife habitat. The table gives ratings for the following wildlife habitat elements: grain and seed crops, grasses and legumes, wild herbaceous upland plants, hardwood woody plants, coniferous woody plants, wetland food and cover plants, shallow-water developments, and ponds.

Ratings are expressed in terms of *good, fair, poor,* and *very poor. Good* habitats generally are easily created, improved, or maintained. Few or no soil limitations affect management. *Fair* habitats generally can be created, improved, or maintained, but these are moderate soil limitations that affect management. *Poor* habitats generally can be created, improved, or maintained, but there are severe soil limitations that affect management. In *very poor* habitats it is very questionable that habitats can be created, improved, or maintained, or it is impractical to do so under prevailing conditions.

Soil characteristics that were evaluated to rate the soils are depth to bedrock, erosion, flooding or ponding, permeability, stoniness, slope, texture, reaction, wetness, depth to seasonal high water table, and available water capacity. The rating of soils for wildlife habitat aids in selecting sites for habitat management, indicates intensity of management needed to produce satisfactory results, and provides a method of grouping known soil conditions for broad-scale planning of wildlife land acquisition and development. The ratings are an aid in showing land users, in conjunction with soil maps, places where management practices for desired wildlife habitat are best applied, and they help them to select the most effective practices. Ratings are also useful in showing why the land user's desire for a particular species of wildlife may not be feasible.

In evaluating the soils for wildlife habitat, no consideration was given to the size and shape of soil areas or to the pattern the areas form with other soils in the landscape. These factors must be considered when an evaluation is made of an area made up of two or more soils. The ability of wildlife to move from place to place also was disregarded, because the wildlife species is not directly rated. Only suitability as habitat is rated, and the criteria for rating apply only to wildlife habitat. Ratings used in this section should not be applied to use of the soils for farming, growing trees, or other purposes. The eight wildlife habitat elements are defined in the following paragraphs.

***Figure 35.*—An area of Wellston silt loam, 12 to 18 percent slopes, severely eroded, abandoned for use as pasture, is returning to woodland by natural regeneration.**

Grain and seed crops.—Domestic grains or seed-crop-producing annual herbaceous plants that are planted to produce foods for wildlife. Among these crops are corn, sorghum, wheat, oats, soybean, millet, sunflower, and buckwheat.

Grasses and legumes.—Domestic perennial grasses and herbaceous legumes that are established by planting and furnish wildlife cover and food. Included are fescue, brome, timothy, redtop, orchardgrass, reed canarygrass, clover, trefoil, alfalfa, sericea lespedeza, and crown vetch.

Wild herbaceous upland plants.—Native or introduced perennial grasses and weeds that provide food and cover mainly to upland wildlife, and that are mainly established through natural processes. Among these plants are bluestem, wildrye, ragweed, lespedeza, goldenrod, and foxtail.

Hardwood woody plants.—Deciduous trees, shrubs, and woody vines that produce fruits, nuts, buds, and twigs of foliage used extensively as food by wildlife. They commonly are established through natural processes but also can be planted. Included are oak, cherry, hawthorn, dogwood, maple, birch, poplar, blueberry, greenbrier, rose, and viburnum.

Coniferous woody plants.—Cone-bearing trees and shrubs, mainly important to wildlife as cover, but which also furnish food in the form of browse, seeds, or fruitlike cones. They commonly are established through natural processes but also can be planted. Included are pine, spruce, white-cedar, hemlock, balsam fir, redcedar, juniper, and yew.

Wetland food and cover plants.—Annual and perennial wild herbaceous plants in moist to wet sites, exclusive of submerged or floating aquatics, that produce food or cover extensively used by wetland wildlife. Included are smartweed, wild millet, bulrush, sedge, reed, cattail, and pondweed.

Shallow-water developments.—These are impoundments or excavated areas for control of water. They generally are no more than 5 feet deep. Examples of shallow-water developments are low dikes and levees, shallow dugouts, level-bottomed ditches, devices for water-level control, and marshy streams and channels.

Ponds.—Dug-out areas that hold water or combinations of such areas and low dikes (dammed areas) that have water of suitable quality, are of suitable depth, and contain ample water for the production of fish or wildlife (fig. 36). An example is a pond that has at least one-fourth acre surface area, an average depth of 6 feet over at least one fourth of the area, and a dependable high-water table or other source of unpolluted water of low acidity. Surface runoff from watershed areas was not considered.

TABLE 3.—*Trees and shrubs for environmental protection grouped according to soil series*

Tree and shrub group and soil series or land type	Soil characteristics or description of land	Species to retain around homes and in parks	Species to plant for woodland crops	Species to plant for windbreaks, screens, and sound barriers	Species to plant for beauty and shade	Species to plant to attract songbirds and other wildlife
I. Birds Bonnie Evansville Ginat Newark Patton Ragsdale Rahm Stendal Wakeland Zipp	Somewhat poorly drained, poorly drained, and very poorly drained, loamy and clayey soils that are in depressions and have a seasonal high water table at a depth of 0 to 3 feet. Water ponds on surface in places, and some soils are subject to flooding.	Pin oak, bur oak, shingle oak, sycamore, sweetgum, river birch.	White pine, sycamore, red maple, white ash, cottonwood.	White pine, Norway spruce, American arborvitae, Lombardy poplar, gray dogwood, silky dogwood, laurelleaf willow, tall purple willow, medium purple willow.	White pine, white spruce, bald cypress, sycamore, sweetgum, pin oak.	American arborvitae, black spruce, gray dogwood, redosier dogwood, silky dogwood, elderberry, Amur honeysuckle, buttonbush.
II. Bartle Henshaw Hosmer Iva Markland McGary Reesville Sciotoville Weinbach Zanesville	Well drained, moderately well drained, and somewhat poorly drained, loamy and level to strongly sloping soils. The somewhat poorly drained soils have a seasonal high water table at a depth of 1 to 3 feet.	Bur oak, pin oak, white oak, scarlet oak, sugar maple, blackgum, tulip-poplar.	White pine, shortleaf pine, tulip-poplar, white ash, sycamore.	White pine, Norway spruce, white spruce, hemlock, autumn-olive, Amur honeysuckle, highbush cranberry, blackhaw, serviceberry, rose of Sharon.	White pine, white spruce, bald cypress, basswood, cornelian-cherry, cutleaf, sumac.	White spruce, autumn-olive, Amur honeysuckle, highbush cranberry, spicebush blackhaw, mapleleaf viburnum, serviceberry, cutleaf sumac.
III. Alford Huntington Iona Lindside Muren Princeton Uniontown Wellston Wheeling Wilbur Woodmere	Well drained and moderately well drained, loamy, level to very steep soils. The well-drained soils have a water table below a depth of 6 feet. The moderately well drained soils have a seasonal high water table at a depth of 3 to 6 feet. Some soils are subject to flooding.	Red oak, white oak, black walnut, tulip-poplar, sugar maple, sycamore, hackberry.	White pine, red pine, Norway spruce, hemlock, autumn-olive.	White pine, red pine, Norway spruce, hemlock, autumn-olive.	White pine, red pine, Norway spruce, tulip-poplar, blackgum, honeylocust (thornless), mountain ash, Norway maple, flowering dogwood, basswood, redbud, white birch.	Hemlock, black locust, mountain ash, flowering dogwood, basswood, redbud, autumn-olive, Amur honeysuckle, blackhaw, serviceberry, hawthorn.
IV. Borrow pits Gullied land Made land	Pits where soil material has been removed, severely gullied soils, and borrow areas and deep depressions filled with debris and covered with soil material.	Sycamore, river birch, ash, red oak.	Acid areas[1]: Sycamore, Eastern black alder, river birch, Virginia pine, white pine. Sweet areas[2]: Tulip-poplar, black walnut, sycamore, Eastern black alder, cottonwood, white pine, shortleaf pine.	Red pine, white pine, autumn-olive, blackhaw, hazelnut, forsythia, lilacs, staghorn sumac, flowering quince.	Red pine, white pine, scarlet oak, honeylocust (thornless), Russian olive. sumac,	Virginia pine, Austrian pine, autumn-olive, blackhaw, serviceberry, hazelnut, staghorn sumac, flowering dogwood.

[1]Reaction of pH 4.0 to 5.5.
[2]Reaction of pH 5.5 or higher.

Figure 36.—**A pond on a Zanesville soil provides an excellent area for wildlife habitat and recreation.**

In the last three columns of table 4, the soils have been rated for kinds of wildlife based on ratings for wildlife habitat elements. The three categories rated and defined in the following paragraphs are open-land wildlife, woodland wildlife, and wetland wildlife.

Open-land wildlife. Birds and mammals that normally frequent croplands, pasture, meadows, lawns, and areas overgrown with grasses, herbs, and shrubby growth. Examples are quail, pheasant, rabbit, and red fox.

Woodland wildlife Birds and mammals that normally frequent wooded areas of hardwood trees and shrubs, coniferous trees and shrubs, or a mixture of such plants. Examples are ruffed grouse, woodcock, gray or fox squirrel, gray fox, and deer.

Wetland wildlife. Birds and mammals that normally frequent such wet areas as ponds, streams, ditches, marshes, and swamps. Examples are duck, goose, rail, mink, and muskrat.

Recreation

The importance of outdoor recreational planning is substantiated by the following statement of the Outdoor Recreation Resources Review Commission: "Outdoor recreational activity, already a major part of American life, will triple by the year 2000. Outdoor recreation should be an integral element in local land-use planning." (*7*)

The location of Vanderburgh County in relationship to centers of population and the landscape and resources of the county make it possible to develop income-producing recreational enterprises. The most likely are hunting areas, shooting preserves, improved picnic areas, camping areas, golf courses, fishing waters, and water sports.

Many recreational facilities have been established and are in use today. Among these are Angel Mounds State Memorial, Mesher Park, Wesselman Park, Fendrich Golf Course, and Helfrich Golf Course.

Watershed development in upland areas offers potential for multipurpose impoundments of different sizes. Some well-drained soils in upland areas are well suited to picnic grounds, intensive play areas, and tent and camp trailer sites.

In table 5 the soils in Vanderburgh County are rated according to their limitations for developing the six kinds of recreation facilities described in the following paragraphs.

Cottages and utility buildings.—These are seasonal or year-round cottages, washrooms and bathrooms, picnic shelters, and service buildings. Factors considered in rating soils for these structures are wetness and flood hazard, slope, rockiness and stoniness, and depth to hard bedrock. Additional items to be considered are suitability for septic-tank filter fields, shrink-swell potential, susceptibility to frost heave, hillside slippage, presence of loose sand, and bearing capacity. Suitability of the soil for supporting vegetation, and whether basements and underground utilities are planned, should be considered in the final evaluation.

Campsites for tents and trailers.—These are areas suitable for tent and camp trailer sites and the accompanying activities of outdoor living. They are used frequently during the camping season. These areas require little site preparation. They should be suitable for unsurfaced parking for car

TABLE 4.—*Suitability of the soils for elements*

[The land types Borrow pits (Br), Gullied land (Gu), and Made

Soil series and map symbols	Elements of wildlife habitat				
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants
Alford:					
AlB2, AlC2	Good	Good	Good	Good	Poor
AlC3	Fair	Fair	Fair	Good	Poor
AlD3	Poor	Fair	Fair	Good	Poor
Bartle: Ba	Fair	Fair	Good	Good	Poor
Birds: Bd	Poor	Fair	Fair	Good	Good
Bonnie: Bo	Poor	Fair	Fair	Good	Good
Evansville: Ev	Very poor	Poor	Poor	Good	Good
Ginat: Gn	Poor	Fair	Moderate	Good	Good
Henshaw: He	Fair	Fair	Good	Good	Poor
Hosmer:					
HoA, HoB2, HoB3, HoC2	Good	Good	Good	Good	Poor
HoC3	Fair	Fair	Fair	Good	Poor
HoD3	Poor	Fair	Fair	Good	Poor
Huntington: Ht, Hu	Fair	Good	Good	Good	Poor
Iona: IoA, IoB2	Good	Good	Good	Good	Poor
Iva: Iv	Fair	Fair	Good	Good	Poor
Lindside: Ln	Fair	Good	Good	Good	Poor
Markland:					
MkB2	Good	Good	Good	Good	Poor
MkC2, MlC3	Fair to poor	Fair	Fair	Good	Poor
McGary: Mr	Fair	Fair	Good	Good	Poor
Muren: MuA, MuB2	Good	Good	Good	Good	Poor
Newark: Nw	Poor	Fair	Fair	Good	Poor
Patton: Pa	Very poor	Poor	Poor	Good	Good
Princeton: PrB	Good	Good	Good	Good	Poor
Ragsdale: Ra	Very poor	Poor	Poor	Good	Good
Rahm: Rh	Fair	Fair	Good	Good	Poor
Reesville: Rs	Fair	Fair	Good	Good	Poor
Sciotoville:					
ScA	Good	Good	Good	Good	Poor
ScB2	Fair	Good	Good	Good	Poor
Stendal: St	Poor	Fair	Fair	Good	Poor
Uniontown: UnB2	Good	Good	Good	Good	Poor
Wakeland: Wa	Fair	Fair	Fair	Good	Poor
Weinbach: Wb	Fair	Fair	Good	Good	Poor
Wellston:					
WeD2	Poor	Fair	Good	Good	Poor
WeD3, WeE2, WeF	Very poor	Poor	Good	Good	Poor
Wheeling:					
WhA, WhB2	Good	Good	Good	Good	Poor
Wilbur: Wm	Fair	Good	Good	Good	Poor
Woodmere: Wo	Fair	Good	Good	Good	Poor
Zanesville:					
ZaC2	Good	Good	Good	Good	Poor
ZaC3	Fair	Fair	Fair	Good	Poor
ZaD2, ZaD3	Poor	Fair	Fair	Good	Poor
Zipp: Zp	Very poor	Poor	Poor	Good	Good

and camp trailers and for heavy traffic by humans, horses, and vehicles. Factors that were considered for ratings are wetness and the flooding hazard, permeability, slope, texture of surface layer, coarse fragments, and stoniness or rockiness. Suitability of the soil for supporting vegetation should be considered in the final evaluation.

Picnic areas, parks, and extensive play areas.—These are areas suitable for heavy foot traffic. They are used by people for the consumption of food in a natural outdoor environment. Ratings are based on wetness and the flooding hazard, slope, texture of the surface layer, and stoniness and rockiness. Ratings do not allow for such features as the presence of trees or ponds that may affect the desirability of a site. Suitability of the soil for supporting vegetation should be considered in the final evaluation.

Playgrounds, athletic fields, and intensive-play areas.—These areas are developed for playgrounds and such organized games as baseball, football, tennis, and badminton. The areas are subject to heavy foot traffic and generally require a level surface, good drainage, and a soil texture and consistence that provides a firm surface. It is assumed that good vegetative cover can be established and maintained on areas where needed.

Bridle paths and nature and hiking trails.—These are areas that are to be used by people for trails, cross-country hiking, bridle paths, and other intensive activities. Factors that were considered for ratings are wetness, the flooding hazard, slope, surface texture, stability, and stoniness and rockiness. It is assumed that these areas are to be used as they occur in nature and that little soil will be moved in to

of wildlife habitat and for kinds of wildlife

land (Ma) were not rated, because the materials are too variable]

Elements of wildlife habitat—Con.			Kinds of wildlife		
Wetland food and cover plants	Shallow-water developments	Ponds	Open-land wildlife	Woodland wildlife	Wetland wildlife
Very poor	Very poor	Very poor	Good	Good	Very poor.
Very poor	Very poor	Very poor	Fair	Fair	Very poor.
Very poor	Very poor	Very poor	Fair	Fair	Very poor.
Fair	Fair	Fair	Good	Fair	Fair.
Fair	Fair	Very poor	Fair	Good	Fair.
Fair	Fair	Very poor	Fair	Good	Fair.
Good	Good	Good	Poor	Good	Good.
Poor	Good	Good	Fair	Good	Fair.
Fair	Fair	Fair	Good	Fair	Fair.
Very poor	Very poor	Very poor	Good	Good	Very poor.
Very poor	Very poor	Very poor	Fair	Fair	Very poor.
Very poor	Very poor	Very poor	Fair	Fair	Very poor.
Very poor	Very poor	Very poor	Good	Good	Very poor.
Poor	Poor	Poor	Good	Good	Very poor.
Poor	Poor	Poor	Good	Fair	Fair.
Poor	Poor	Poor	Good	Good	Poor.
Very poor	Very poor	Very poor	Good	Good	Very poor.
Very poor	Very poor	Very poor	Good to fair	Good to fair	Very poor.
Fair to poor	Fair to poor	Fair to poor	Good	Fair	Fair.
Poor	Poor	Poor	Good	Good	Very poor.
Fair	Fair	Very poor	Fair	Fair	Fair.
Good	Good	Good	Poor	Good	Good.
Very poor	Very poor	Very poor	Good	Good	Very poor.
Good	Good	Good	Poor	Good	Good.
Fair	Fair	Fair	Good	Fair	Fair.
Poor	Poor	Poor	Good	Fair	Fair.
Poor	Poor	Poor	Good	Good	Poor.
Very poor	Very poor	Very poor	Good	Good	Very poor.
Fair	Fair	Very poor	Fair	Fair	Fair.
Very poor	Very poor	Very poor	Good	Good	Very poor.
Fair	Fair	Poor	Good	Fair	Fair.
Fair	Very poor	Very poor	Good	Fair	Fair.
Very poor	Very poor	Very poor	Fair	Fair	Very poor.
Very poor	Very poor	Very poor	Poor	Fair	Very poor.
Very poor	Very poor	Very poor	Good	Good	Very poor.
Very poor	Very poor	Very poor	Good	Good	Poor.
Poor	Poor	Poor	Good	Good	Poor.
Very poor	Very poor	Very poor	Good	Good	Very poor.
Very poor	Very poor	Very poor	Fair	Fair	Very poor.
Very poor	Very poor	Very poor	Fair	Fair	Very poor.
Good	Good	Good	Poor	Good	Good.

provide for this recreational use.

From a physical standpoint, the most desirable soils for bridle paths and nature and hiking trails are those having good foot and hoof trafficability. They are well drained, loamy, and nearly level to sloping. Such soils have good stability, are not subject to erosion or cutting out, and are free of coarse fragments and stones or rock outcrops. Consideration should be given to placement of paths and trails on sloping relief on the contour to help control erosion. Variability in slope gradient on paths and trails may increase interest; but slopes should not exceed 12 percent for prolonged distances.

Golf course fairways.—In evaluating the use of soils for golf courses, only those features were considered that influence use of the soils for fairways. Greens, traps, and hazards are manmade, generally from disturbed, transported soil material. Also, trees are planted by man. For best use, fairways should be well drained and firm, be free of flooding during periods of use, have good trafficability, contain a minimum of coarse fragments or stones, and have gently undulating slopes. The soils should be capable of supporting a good turf and be well suited to many kinds of trees and shrubs. Loamy soils are most desirable, but irrigated, coarser textured soils serve equally well. Poorly drained mineral soils have severe limitations, but can be used for ponds that provide esthetic value and store water for turf maintenance. Sandy soils can be used for hazards or as a source for sand for greens.

The ratings used in table 5 are *slight, moderate,* and *severe.* For a rating other than *slight,* the degree of limitation

TABLE 5.—*Limitations of*

[The land types Borrow pits (Br), Gullied land (Gu), and Made land (Ma)

Soil series and map symbols	Cottages and utility buildings	Campsites for tents and trailers
Alford:		
AlB2	Slight	Slight
AlC2	Moderate: moderately sloping	Moderate: moderately sloping
AlC3	Moderate: moderately sloping	Moderate: moderately sloping
AlD3	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.
Bartle: Ba	Moderate: seasonal high water table.	Severe: somewhat poorly drained; very slow permeability.
Birds: Bd	Severe: poorly drained; subject to flooding.	Severe: poorly drained; subject to flooding.[1]
Bonnie: Bo	Severe: poorly drained; subject to flooding.	Severe: poorly drained; subject to flooding.[1]
Evansville: Ev	Severe: poorly drained; high water table; subject to ponding.	Severe: poorly drained; high water table; subject to ponding.
Ginat: Gn	Severe: poorly drained; high water table; very slow permeability; subject to ponding.	Severe: poorly drained; high water table; very slow permeability; subject to ponding.
Henshaw: He	Moderate: seasonal high water table.	Moderate: somewhat poorly drained.
Hosmer:		
HoA	Slight	Moderate: very slow permeability; dries slowly after rains.
HoB2	Slight	Moderate: gently sloping
HoB3	Slight	Moderate: gently sloping
HoC2	Moderate: moderately sloping	Moderate: moderately sloping; very slow permeability.
HoC3	Moderate: moderately sloping	Moderate: moderately sloping; very slowly permeable.
HoD3	Severe: strongly sloping	Severe: strongly sloping
Huntington: Ht, Hu	Severe: subject to flooding	Severe: subject to flooding[1]
Iona:		
IoA	Slight	Slight
IoB2	Slight	Slight
Iva: Iv	Moderate: seasonal high water table.	Moderate: somewhat poorly drained; slow permeability.
Lindside: Ln	Severe: subject to flooding	Severe: subject to flooding[1]
Markland:		
MkB2	Slight	Moderate: slow permeability; slow to dry after rains.
MkC2, MlC3	Moderate where slope is less than 12 percent; severe where slope is more than 12 percent.	Moderate where slope is less than 12 percent; severe where slope is more than 12 percent.
McGary: Mr	Moderate: seasonal high water table.	Moderate: somewhat poorly drained; slow permeability.
Muren:		
MuA	Slight	Slight
MuB2	Slight	Slight
Newark: Nw	Severe: subject to flooding	Severe: subject to flooding[1]
Patton: Pa	Severe: poorly drained; high water table; subject to ponding.	Severe: poorly drained; high water table; subject to ponding.
Princeton: PrB	Slight	Slight
Ragsdale: Ra	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.
Rahm: Rh	Severe: subject to flooding	Severe: subject to flooding[1]
Reesville: Rs	Moderate: seasonal high water table.	Moderate: somewhat poorly drained; moderately slow permeability; slow to dry after rains.[1]
Sciotoville: ScA, ScB2	Slight	Moderate: very slow permeability; slow to dry after rains.

the soils for recreational uses

were not rated because the properties are too variable for reliable estimates]

Picnic areas, parks, and extensive play areas	Playgrounds, athletic fields, and intensive-play areas	Bridle paths and nature and hiking trails	Golf course fairways
Slight	Moderate: gently sloping	Slight	Slight.
Moderate: moderately sloping	Severe: moderately sloping	Slight	Moderate: moderately sloping.
Moderate: moderately sloping	Severe: moderately sloping	Slight	Severe: severely eroded.
Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Moderate: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.
Moderate: somewhat poorly drained.	Severe: somewhat poorly drained; very slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Severe: poorly drained; subject to flooding.[1]	Severe: poorly drained; subject to flooding.[1]	Severe: poorly drained; subject to flooding.[1]	Severe: poorly drained; subject to flooding.[1]
Severe: poorly drained; subject to flooding.[1]	Severe: poorly drained; subject to flooding.[1]	Severe: poorly drained; subject to flooding.[1]	Severe: poorly drained; subject to flooding.[1]
Severe: poorly drained; high water table; subject to ponding.	Severe: poorly drained; high water table; subject to ponding.	Severe: poorly drained; high water table; subject to ponding.	Severe: poorly drained; high water table; subject to ponding.
Severe: poorly drained; high water table; very slow permeability; subject to ponding.	Severe: poorly drained; high water table; very slow permeability; subject to ponding.	Severe: poorly drained; high water table; very slow permeability; subject to ponding.	Severe: poorly drained; high water table; very slow permeability; subject to ponding.
Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Slight	Moderate: very slow permeability; dries slowly after rains.	Slight	Slight.
Slight	Moderate: gently sloping; very slowly permeable.	Slight	Slight.
Slight	Moderate: gently sloping; very slowly permeable.	Slight	Moderate: severely eroded.
Moderate: moderately sloping	Severe: moderately sloping	Slight	Moderate: moderately sloping.
Moderate: moderately sloping	Severe: moderately sloping	Slight	Severe: severely eroded.
Severe: strongly sloping	Severe: strongly sloping	Moderate: strongly sloping	Severe: strongly sloping.
Moderate: subject to flooding[1]	Severe: subject to flooding[1]	Moderate: subject to flooding[1]	Moderate: subject to flooding.[1]
Slight	Slight	Slight	Slight.
Slight	Moderate: gently sloping; moderately slow permeability.	Slight	Slight.
Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Moderate: subject to flooding[1]	Severe: subject to flooding[1]	Moderate: subject to flooding[1]	Moderate: subject to flooding.[1]
Slight	Moderate: slow permeability; slow to dry after rains.	Slight	Slight.
Moderate where slope is less than 12 percent; severe where slope is more than 12 percent.	Severe: 6 to 18 percent slope.	Slight where slope is less than 12 percent; moderate where slope is more than 12 percent.	Moderate where slope is less than 12 percent; severe where slope is more than 12 percent.
Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Slight	Slight	Slight	Slight.
Slight	Moderate: gently sloping; moderately slow permeability.	Slight	Slight.
Moderate: subject to flooding[1]	Severe: subject to flooding[1]	Severe: subject to flooding[1]	Moderate: subject to flooding.[1]
Severe: poorly drained; high water table; subject to ponding.	Severe: poorly drained; high water table; subject to ponding.	Severe: poorly drained; high water table; subject to ponding.	Severe: poorly drained; high water table; subject to ponding.
Slight	Moderate: gently sloping	Slight	Slight.
Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.
Moderate: subject to flooding[1]	Severe: subject to flooding[1]	Moderate: subject to flooding[1]	Moderate: subject to flooding.[1]
Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; moderately slow permeability; dries slowly after rains.[1]	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Slight	Moderate: very slow permeability; dries slowly after rains.	Slight	Slight.

TABLE 5.—*Limitations of the soils*

Soil series and map symbols	Cottages and utility buildings	Campsites for tents and trailers
Stendal: St	Severe: subject to flooding	Severe: subject to flooding[1]
Uniontown: UnB2	Slight	Moderate: moderately slow permeability; dries slowly after rains.
Wakeland: Wa	Severe: subject to flooding	Severe: subject to flooding[1]
Weinbach: Wb	Moderate: seasonal high water table.	Severe: somewhat poorly drained; very slow permeability.
Wellston:		
WeD2, WeD3, WeE2	Severe: slopes of more than 12 percent.	Severe: slopes of more than 12 percent.
WeF	Severe: slopes of more than 12 percent.	Severe: slopes of more than 12 percent.
Wheeling:		
WhA	Slight	Slight
WhB2	Slight	Slight
Wilbur: Wm	Severe: subject to flooding	Severe: subject to flooding[1]
Woodmere: Wo	Severe: subject to flooding	Severe: subject to flooding[1]
Zanesville:		
ZaC2	Moderate: moderately sloping	Moderate: moderately sloping; very slow permeability.[1]
ZaC3	Moderate: moderately sloping	Moderate: moderately sloping; very slowly permeable.
ZaD2, ZaD3	Severe: strongly sloping	Severe: strongly sloping
Zipp: Zp	Severe: very poorly drained; high water table; subject to ponding or flooding.	Severe: very poorly drained; subject to ponding or flooding; very slow permeability.[1]

[1]Frequency and intensity of flooding are variable; onsite inspection required.

of the soil for developing a specific recreation facility is also given. A rating of *slight* means that the facility is easily created, improved, or maintained. There are few or no limitations that affect design or management. A *moderate* rating means that the facility generally can be created, improved, or maintained, but there are moderate soil limitations that affect design and management. A rating of *severe* means that the practicability of establishing the facility is questionable. Extreme measures are needed to overcome the limitations, and usage generally is unsound or impractical.

Engineering Uses of Soils[3]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, water-storage facilities, erosion-control structures, drainage systems, and sewage disposal systems. Among the properties that are most important to engineers are permeability, shear strength, compaction characteristics, drainage, shrink-swell potential, grain size, plasticity, and degree of acidity or alkalinity. Topography, depth to the water table, and depth to bedrock are also important.

The properties of the soils in Vanderburgh County that most affect engineering are discussed in this section. Tables 6, 7, and 8 provide soil data useful in engineering. Only the data in table 6 are from actual laboratory tests. The estimates in tables 7 and 8 are based on comparisons of soils with those tested in other areas of Indiana. The information contained in this section can be used in—

[3]HAROLD W. BELCHER, area engineer, and ROBERT E. DUNN, agricultural engineer, Soil Conservation Service, assisted in the preparation of this section.

1. Planning and designing drainage systems, ponds for water supply, recreation and irrigation systems, diversion terraces, and other structures for controlling water and conserving soil.
2. Selecting potential locations for highways, airports, pipelines, and underground cables.
3. Locating probable sources of sand or gravel suitable for use as construction material.
4. Selecting potential industrial, commercial, residential, educational, and recreational areas.

When used with the soil map for identification, the engineering interpretations reported here can be useful for many purposes. They do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads or excavations deeper than the depths of the layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that can be expected.

Some terms used by soil scientists may be unfamiliar to engineers. Other terms, for example, *soil, clay, silt, sand,* and *aggregate*, have special meanings in soil science. These terms and others are defined in the Glossary at the back of this publication.

Information useful in engineering can be obtained from the soil map. It will often be necessary, however, to refer to other parts of the survey. By using the information on the soil map, the soil profile descriptions, and the tables in this section, the engineer can plan a detailed investigation of the soil at the construction site.

Engineering classification systems

Two systems of classifying soils for engineering purposes are used in this soil survey. Most highway engineers classify

for recreational uses—Continued

Picnic areas, parks, and extensive play areas	Playgrounds, athletic fields, and intensive-play areas	Bridle paths and nature and hiking trails	Golf course fairways
Moderate: subject to flooding[1]	Severe: subject to flooding[1]	Moderate: subject to flooding[1]	Moderate: subject to flooding.[1]
Slight	Moderate: moderately slow permeability; dries slowly after rains; gently sloping.	Slight	Slight.
Moderate: subject to flooding[1]	Severe: subject to flooding[1]	Moderate: subject to flooding.[1]	Moderate: subject to flooding.[1]
Moderate: somewhat poorly drained.	Severe: somewhat poorly drained; very slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Severe: slopes of more than 12 percent.	Severe: slopes of more than 12 percent.	Moderate: 12 to 25 percent slopes.	Severe: slopes of more than 12 percent.
Severe: slopes of more than 12 percent.	Severe: slopes of more than 12 percent.	Severe: slopes of more than 25 percent.	Severe: slopes of more than 12 percent.
Slight	Slight	Slight	Slight.
Slight	Moderate: gently sloping	Slight	Slight.
Severe: subject to flooding[1]	Severe: subject to flooding[1]	Moderate: subject to flooding[1]	Moderate: subject to flooding.[1]
Severe: subject to flooding[1]	Severe: subject to flooding[1]	Moderate: subject to flooding[1]	Moderate: subject to flooding.[1]
Moderate: moderately sloping	Severe: moderately sloping	Slight	Moderate: moderately sloping.
Moderate: moderately sloping	Severe: moderately sloping	Slight	Severe: severely eroded.
Severe: strongly sloping	Severe: strongly sloping	Moderate: strongly sloping	Severe: strongly sloping.
Severe: very poorly drained; subject to ponding or flooding.[1]	Severe: very poorly drained; subject to ponding or flooding; very slow permeability.[1]	Severe: high water table; very poorly drained; subject to ponding or flooding.[1]	Severe: high water table; very poorly drained; subject to ponding or flooding.[1]

soils in accordance with the system approved by the American Association of State Highway Officials (AASHO) (*1*). In this system soils are placed in seven principal groups, based on mechanical analysis and plasticity test data. The groups range from A-1, consisting of gravelly soils of high bearing capacity, the best soils for subgrades, to A-7, consisting of clayey soils having low strength when wet, the poorest soils for subgrades. Highly organic soils, such as peat and muck, are not included in this classification, because they are not suitable for use as construction material or foundation material. The relative engineering values of soils within each group are indicated by group index numbers. The numbers range from 0 for the best material to 20 for the poorest. In table 6 the group index number is shown in parentheses following the soil group symbol, for example, A-4(8). Group index numbers can be established only by laboratory tests and are not given in tables 7 or 8. Estimated AASHO classifications for all the soils of the county are given in table 7.

Some engineers prefer to use the Unified Soil Classification System (*13*) established jointly by the Corps of Engineers and the Bureau of Reclamation.

The Unified system is used to classify soils according to engineering uses for building material or for the support of structures other than highways. Soils are classified according to particle-size distribution, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes. Eight classes of coarse-grained soils are subdivided on the basis of gravel and sand content. These are identified as GW, GP, GM, GC, SW, SP, SM, and SC. Six classes of fine-grained soils are subdivided on the basis of the plasticity index. Nonplastic classes are ML, MH, OL, and OH; plastic classes are CL and CH. One class of highly organic soils is in the system and is designated by the symbol Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, CL-ML. Table 6 shows estimated Unified classifications of all soils in the county.

Engineering test data

Table 6 presents test data on samples of four soil series in the county. These samples were tested by standard procedures in the laboratories of the Indiana State Highway Commission Research and Training Center. The samples do not represent all the soils in Vanderburgh County, and they do not include the entire range of characteristics of any series sampled. Not all layers of each profile were sampled. The test results, however, have been used as a general guide in estimating the engineering properties of the soils of the county. Tests were made for moisture-density relationships, liquid limit, and plastic limit. Texture was determined by mechanical analysis.

Moisture-density relationships indicate the moisture content at which soil material can be compacted to maximum dry density. If a soil is compacted at successively higher moisture content, assuming that the compactive effort remains the same, the density of the compacted material increases until the optimum moisture content is reached. After that, the density decreases with increase in moisture content. The oven-dry weight, in pounds per cubic foot, of soil material that was compacted at optimum moisture content is termed the maximum dry density. Data on the relationship of moisture to density is important in planning earthwork, for generally a soil is most stable if compacted to about its maximum dry density when it is at approximately the optimum moisture content.

TABLE 6.—*Engineering*

[Tests performed by Indiana State Highway Commission Research standard procedures of the American Association

Soil name and location	Parent material	Report number S-71 IN 82	Depth	Moisture-density data[1]	
				Maximum dry density	Optimum moisture
			In	*Lb/ft³*	*Pct*
Zipp silty clay: NE¼NE¼ sec. 2, T. 6 S., R. 10 W. (Modal).	Alkaline, lacustrine sediment.	1-1	0-6	103	19
		1-3	13-25	108	17
		1-5	43-60	107	17
Huntington silty clay loam: NW¼SE¼ sec. 9, T. 7 S., R. 10 W. (Modal).	Neutral, stratified Ohio River sediment.	2-1	0-10	100	20
		2-2	20-33	103	19
		2-3	43-62	109	16
Weinbach silt loam: SE¼NE¼ sec. 4, T. 7 S., R. 10 W. (Modal).	Strongly acid, stratified Ohio River sediment.	3-1	0-9	104	17
		3-5	34-46	106	18
		3-7	57-65	118	13
Sciotoville silty loam: SE¼NW¼ sec. 3, T. 7 S., R. 11 W. (Modal).	Strongly acid, stratified Ohio River sediment.	4-1	0-10	102	19
		4-2	23-36	106	19
		4-3	52-60	112	15

[1]Based on the Moisture-density Relations of Soils Using 5.5-lb. Rammer and 12-in. Drop, AASHO Designation T 99, Method A and one-point determination.

[2]Mechanical analyses according to the AASHO Designation T 88. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 mm in diameter. In the

Estimated properties

Table 7 presents estimates of some soil properties that are significant in engineering. Since actual tests were made only for the four soils listed in table 6, it was necessary to estimate the engineering properties for the rest of the soils. Estimates were based upon a comparison of soils in the county with those that have been sampled and tested in other areas and upon experiences gained from working with and observing similarly classified soils.

These estimates provide information that an engineer would otherwise have to obtain for himself, but the estimates are not a substitute for the detailed tests needed at a specific site selected for construction purposes. The information in this table applies, in general, to depths of 5 feet and less. Depth to bedrock for most soils in this county is beyond the depth to which soils were investigated in field mapping. Depth to bedrock is 40 to 60 inches in Wellston soils, however, and 60 to 80 inches in Zanesville soils.

A brief explanation of each column in table 7 follows:

Depth to seasonal high water table.—The highest level of free water in the soil at any time during the year.

Frost-heave potential.—Frost action includes heave caused by ice lenses forming in a soil and the subsequent loss of strength as a result of excess moisture during periods of thawing. The following three conditions must exist for frost heave to become a major consideration: a susceptible soil, a source of water during the freezing period, and freezing temperatures that persist long enough to penetrate the ground.

Depth from surface.—Generally, only the major horizons and their depths are listed. Special horizons are listed when they have engineering properties significantly different from those of the adjacent horizons.

USDA texture.—The United States Department of Agriculture textural classification is based on the relative amount of sand, silt, and clay particles in a soil.

Unified.—This classification of soil materials is according to the Unified Soil Classification System (*13*).

AASHO.—This classification of soil materials is according to the system of the American Association of State Highway Officials (*1*).

Percentage passing sieves 10, 40, and 200.—The values in these columns are estimates rounded off to the nearest 5 percent. Gravel-size material does not pass the No. 10 sieve. The material that passes the No. 200 sieve is mainly silt and clay, but the smaller grains of very fine sand also pass it.

Permeability.—As used here, permeability is an estimate of the rate at which saturated soil transmits water in a vertical direction under a unit head of pressure. It is estimated on the basis of those soil characteristics observed in the field, particularly structure, porosity, and texture. Lateral seepage or such transient soil features as plowpans and surface crusts are not considered.

Available water capacity.—As used here, available water capacity is an estimate of the capacity of a soil to hold water in a form available for use by most plants. It is the amount of water held in the soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

Reaction.—This column indicates the degree of alkalinity or acidity by listing estimated ranges in field pH values for each major horizon.

Shrink-swell potential.—This is the quality of the soil that determines its volume change in proportion to its moisture content. The shrink-well potential of a soil is estimated mainly on the basis of the amount and kind of clay in a soil.

test data

and Training Center, West Lafayette, Indiana, in accordance with
of State Highway Officials (AASHO) *(1)*]

Mechanical analysis[2]							Liquid limit	Plasticity index	Classification	
Percentage passing sieve—			Percentage smaller than—							
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHO[3]	Unified[4]
100	100	97	93	75	42	29	41	17	A-7-6(11)	CL
100	98	96	94	72	47	34	45	14	A-7-5(11)	ML
100	97	96	94	79	48	34	41	19	A-7-5(12)	CL
100	100	98	94	78	42	24	44	11	A-7-5(9)	ML
100	100	99	94	70	37	23	46	13	A-7-5(10)	ML
100	100	95	83	47	25	18	29	6	A-4(8)	ML
100	95	80	75	58	27	12	27	1	A-4(8)	ML
100	99	92	84	60	30	22	32	10	A-4(8)	CL
100	99	52	42	23	13	11	21	3	A-4(3)	ML
99	93	79	77	61	23	11	30	5	A-4(8)	ML
100	99	97	96	82	42	28	36	12	A-6(9)	ML
100	100	82	71	42	19	15	25	4	A-4(8)	ML

SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 mm in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

[3]Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1, Ed. 8). The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation M 145-49.

[4]Unified Soil Classification System *(13)*.

Interpretations of soil properties

Table 8 gives interpretations of the suitability of the soils for specific engineering uses. The interpretations include the suitability of the soils as sources of topsoil, sand and gravel, and road subgrade and the soil features affecting use for highway location, agricultural drainage, ponds, and grassed waterways. These interpretations apply to the representative profile of each soil series, as described in the section "Descriptions of the Soils."

Some soil features may be helpful in one kind of engineering work and a hindrance in another kind. For example, a permeable substratum makes a soil unsuitable as a site for a farm pond, but that soil might be favorable for a highway location. The column headings and ratings of suitability in table 8 are explained in the following paragraphs.

Topsoil.—This refers to soil material, preferably high in organic-mater content, used to spread on embankments, lawns, gardens, and other areas to hasten the establishment of vegetation. The suitability ratings are based on texture and organic-matter content.

Sand and gravel.—The ratings apply to soil material within a depth of 5 to 7 feet. Sand or sand and gravel occur at variable depths within soils of the same series. Test pits are needed to determine the extent and availability of sand or sand and gravel.

Road subgrade material.—The suitability of the soil depends upon its performance when used as borrow for subgrade. Both the subsoil and the substratum are rated. Soil features considered are drainage, texture, shrink-swell potential, susceptibility to frost heave, and slope.

Highway location.—The entire profile is evaluated. The ratings are for undisturbed soil without artificial drainage. Soil features considered are those that affect overall performance of the soil, such as, drainage, flooding, slope, shrink-swell potential, and susceptibility to frost action.

Dikes, levees, and other embankments.—The features considered are those that affect the use of disturbed soil material for construction of embankments to impound surface water. They include shear strength, compressibility, permeability of compacted soil, and susceptibility to piping.

Pond reservoir areas.—Permeability, which affects seepage, is the main feature considered. Other features considered are depth to the water table and slope.

Agricultural drainage.—Texture, permeability, topography, seasonal water table, and restricting layers are considered in rating soils for this use.

Terraces and diversions.—The features considered are those that affect the layout and construction of terraces and diversions. Such features include topography, texture, and depth to soil material not suited to crops.

Grassed waterways.—Suitability depends on soil features that affect establishment, growth, and maintenance of vegetation and the layout and construction of the waterways. Features considered are texture, thickness of suitable material, and slope.

Town and Country Planning

Residential, commercial, industrial, and institutional developments are growing rapidly in Vanderburgh County as the suburbs of Evansville expand into the rural areas. The rapidity of such expansion has led to many problems. These problems clearly show the need for careful planning and for broad understanding of the physical and economic aspects involved when the use of the land is changed.

This soil survey will help in planning these developments and in solving problems that arise as use of the land changes.

TABLE 7.—*Estimated soil properties*

[> means greater than;

Soil series and map symbols	Depth to seasonal high water table	Frost-heave potential	Depth from surface	USDA texture
	Ft		*In*	
Alford: AlB2, AlC2, AlC3, AlD3	>6	Moderate	0–8	Silt loam
			8–52	Light silty clay loam to silt loam
			52–72	Silt loam
Bartle: Ba	1–3	Moderate	0–16	Silt loam
			16–27	Heavy silt loam
			27–53	Heavy silt loam to light silty clay loam.
			53–60	Stratified silt loam and silty clay loam.
Birds: Bd	0–1	High	0–60	Silt loam
Bonnie: Bo	0–1	High	0–60	Silt loam
Borrow pits: Br. Too variable to be rated.				
Evansville: Ev	[2]0–1	High	0–9	Silt loam
			9–44	Silty clay loam
			44–66	Light silty clay loam and silty clay loam.
Ginat: Gn	0–1	High	0–17	Silt loam
			17–23	Heavy silt loam
			23–52	Light silty clay loam to silty clay loam.
			52–63	Light silty clay loam
			63–75	Stratified silty clay loam and silt loam.
Gullied land: Gu. Too variable to be rated.				
Henshaw: He	1–3	High	0–7	Silt loam
			7–28	Light silty clay loam to silty clay loam.
			28–36	Heavy silty clay loam
			36–43	Light silty clay loam
			43–60	Stratified silt loam and silty clay loam.
Hosmer: HoA, HoB2, HoB3, HoC2, HoC3, HoD3.	>6	Moderate	0–12	Silt loam
			12–29	Light silty clay loam
			29–68	Silt loam to heavy silt loam
			68–73	Silt loam
Huntington: Ht	>6	Moderate	0–10	Silty clay loam
			10–43	Light silty clay loam to heavy silt loam.
			43–62	Stratified silt loam and fine sandy loam.
Huntington, sandy variant: Hu	>6	Moderate	0–40	Fine sandy loam
			40–70	Stratified silt loam, light silty clay loam, and fine sandy loam.
Iona: IoA, IoB2	3–6	Moderate	0–8	Silt loam
			8–33	Silty clay loam
			33–60	Silt loam
Iva: Iv	1–3	High	0–17	Silt loam
			17–37	Silty clay loam
			37–60	Silt loam

significant to engineering
< means less than]

Classification		Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 10	No. 40	No. 200				
					In/hr	*In/in of soil*	*pH*	
ML or CL	A-4 or A-6	100	90–100	85–95	0.60–2.00	0.22–0.24	5.6–7.3	Low.
CL	A-6	100	95–100	85–95	0.60–2.00	0.19–0.21	5.1–6.0	Moderate.
CL or ML	A-6 or A-4	100	90–100	85–95	0.60–2.00	0.20–0.22	5.6–6.5	Low.
ML or CL	A-4 or A-6	100	90–100	80–90	0.60–2.00	0.22–0.24	5.6–7.0	Low.
ML or CL	A-4 or A-6	100	90–100	70–90	0.60–2.00	0.19–0.21	4.5–5.5	Low.
ML or CL	A-4 or A-6	100	90–100	75–90	<0.06	[1]0.06–0.08	4.5–5.5	Moderate.
ML or CL	A-4 or A-6	100	90–100	75–95	0.20–2.00	[1]0.06–0.08	5.6–6.5	Moderate.
ML or CL	A-4 or A-6	100	90–100	85–95	0.06–0.20	0.21–0.23	5.6–7.3	Low.
ML or CL	A-4 or A-6	100	90–100	85–95	0.06–0.20	0.21–0.23	4.5–6.5	Low.
ML or CL	A-4 or A-6	100	95–100	85–95	0.60–2.00	0.22–0.24	6.1–7.8	Low.
CL	A-6 or A-7	100	95–100	85–95	0.60–2.00	0.18–0.20	6.1–7.8	Moderate.
CL	A-6	100	95–100	85–95	0.60–2.00	0.18–0.20	6.1–7.8	Moderate.
ML or CL	A-4 or A-6	100	85–95	85–95	0.60–2.00	0.22–0.24	4.5–6.5	Low.
ML or CL	A-4 or A-6	100	95–100	5–95	0.60–2.00	0.19–0.21	4.5–5.5	Low to moderate.
CL	A-6	100	95–100	85–95	<0.06	[1]0.06–0.08	4.5–5.5	Moderate.
CL	A-6	100	95–100	85–95	0.60–2.00	[1]0.06–0.08	4.5–5.5	Moderate.
CL or ML	A-6 or A-4	100	95–100	70–90	0.60–2.00	[1]0.06–0.08	4.5–5.5	Moderate.
ML or CL	A-4 or A6	100	90–100	75–95	0.60–2.00	0.22–0.24	6.1–7.3	Low.
CL	A-6	100	95–100	85–95	0.60–2.00	0.19–0.21	5.1–5.5	Moderate to high.
CL or CH	A-6 or A-7	100	95–100	75–95	0.20–0.60	0.17–0.20	5.6–6.0	Moderate to high.
CL	A-6	100	90–100	85–95	0.60–2.00	0.18–0.20	6.1–6.5	Moderate.
CL or ML	A-6 or A-4	100	90–100	80–90	0.60–2.00	0.18–0.20	7.9–8.4	Moderate.
ML or CL	A-4 or A-6	100	90–100	85–95	0.60–2.00	0.22–0.24	5.1–6.0	Low.
CL	A-6	100	90–100	85–95	0.60–2.00	0.18–0.20	4.5–5.5	Moderate.
ML or CL	A-4 or A-6	100	90–100	85–95	<0.06	[1]0.06–0.08	4.5–5.0	Low.
ML or CL	A-4 or A-6	100	90–100	85–95	0.63–2.00	[1]0.06–0.08	4.5–6.0	Low.
CL or ML	A-6	100	95–100	85–95	0.60–2.00	0.21–0.23	6.1–7.8	Moderate.
CL or ML	A-6 or A-7	100	90–100	85–95	0.60–2.00	0.19–0.21	6.1–7.8	Low to moderate.
ML	A-4	100	80–90	75–85	0.60–2.00	0.20–0.22	6.1–7.8	Low.
SM or ML	A-4	100	90–100	40–55	2.00–6.00	0.16–0.18	6.1–7.8	Low.
ML or CL	A-4 or A-6	100	90–100	75–85	2.00–6.00	0.17–0.20	6.1–7.8	Low.
ML or CL	A-4 or A-6	100	90–100	85–95	0.60–2.00	0.22–0.24	5.6–6.5	Low.
CL	A-6	100	95–100	85–95	0.20–0.60	0.18–0.20	5.6–6.5	Moderate.
ML	A-4	100	90–100	85–95	0.60–2.00	0.20–0.22	5.6–8.4	Low.
ML or CL	A-4 or A-6	100	90–100	85–95	0.60–2.00	0.22–0.24	5.6–6.5	Low.
CL	A-6	100	95–100	85–95	0.06–0.20	0.18–0.20	5.1–6.0	Moderate.
ML or CL	A-4 or A-6	100	90–100	75–95	0.60–2.00	0.20–0.22	5.6–6.5	Low.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Frost-heave potential	Depth from surface	USDA texture
	Ft		*In*	
Lindside: Ln	3–6	High	0–20	Silty clay loam and light silty clay loam.
			20–40	Silt loam
			40–60	Stratified silt loam and light silty clay loam; thin lenses of fine sand.
Made land: Ma Too variable to be rated.				
Markland: MkB2, MkC2, MlC3	>6	Moderate	0–10	Silt loam and light silty clay loam.
			10–28	Silty clay
			28–60	Stratified silty clay and silty clay loam; thin layers of silt loam.
McGary: Mr	1–3	Moderate	0–10	Silt loam
			10–60	Silty clay
Muren: MuA, MuB2	3–6	Moderate	0–10	Silt loam
			10–50	Silty clay loam and heavy silt loam.
			50–60	Silt loam
Newark: Nw	1–3	High	0–60	Silty clay loam
Patton: Pa	0–1	High	0–11	Silty clay loam
			11–41	Silty clay loam
			41–60	Light silty clay loam
Princeton: PrB	>6	Moderate	0–11	Fine sandy loam
			11–30	Sandy clay loam and light sandy clay loam.
			30–46	Heavy sandy loam and light sandy loam.
			46–60	Loamy sand
Ragsdale: Ra	[2]0–1	High	0–16	Silt loam
			16–45	Silty clay loam and light silty clay loam.
			45–60	Silt loam
Rahm: Rh	1–3	High	0–10	Silty clay loam
			10–58	Light silty clay loam to silty clay loam.
			58–70	Silty clay loam
Reesville: Rs	1–3	High	0–11	Silt loam
			11–35	Silty clay loam
			35–60	Silt loam
Sciotoville: ScA, ScB2	3–6	Low to moderate	0–12	Silt loam
			12–23	Light silty clay loam
			23–52	Light silty clay loam to heavy silt loam.
			52–60	Silt loam
Stendal: St	1–3	High	0–60	Silt loam
Uniontown: UnB2	>6	Moderate	0–10	Silt loam to light silty clay loam
			10–40	Silty clay loam to heavy silty clay loam.
			40–60	Stratified silty clay and silty clay loam.
Wakeland: Wa	1–3	High	0–60	Silt loam

significant to engineering—Continued

Classification		Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 10	No. 40	No. 200				
					In/hr	In/in of soil	pH	
CL or ML	A-6 or A-4	100	95–100	90–100	0.60–2.00	0.21–0.23	6.1–7.3	Moderate.
ML or CL	A-4 or A-6	100	95–100	90–100	0.60–2.00	0.20–0.22	6.1–7.3	Low.
ML or CL	A-4 or A-6	100	90–100	80–85	0.60–2.00	0.19–0.21	6.1–7.3	Low.
ML or CL	A-6	100	90–100	85–95	0.60–2.00	0.21–0.24	5.1–7.3	Moderate.
CH	A-7	100	95–100	90–100	0.06–0.20	0.11–0.13	5.6–6.0	High.
CH or CL	A-7 or A-6	100	95–100	85–95	0.06–2.00	0.16–0.18	6.6–8.4	Moderate to high.
ML or CL	A-4 or A-6	100	90–100	85–95	0.60–2.00	0.22–0.24	5.6–7.3	Low.
CH	A-7	100	95–100	90–100	0.06–0.20	0.11–0.13	[3]6.6–6.5 [4]6.6–7.8	High.
ML or CL	A-4 or A-6	100	90–100	85–95	0.60–2.00	0.22–0.24	6.1–6.5	Low.
CL	A-6	100	95–100	85–95	0.20–0.60	0.19–0.21	5.1–5.5	Moderate.
ML or CL	A-4 or A-6	100	90–100	85–95	0.60–2.00	0.20–0.22	5.5–6.5	Low.
CL	A-6	100	95–100	85–95	0.20–0.60	0.21–0.23	6.1–7.8	Moderate.
CL	A-6	100	95–100	85–95	0.60–2.00	0.21–0.23	6.1–7.3	Moderate.
CL	A-6 or A-7	100	95–100	80–95	0.60–2.00	0.18–0.20	6.6–7.3	Moderate.
CL	A-6	100	95–100	85–95	0.60–2.00	0.18–0.21	6.6–7.8	Moderate.
SM or ML	A-4	100	90–100	40–55	2.00–6.00	0.16–0.18	6.1–7.3	Low.
SC	A-6	100	80–90	40–50	0.60–2.00	0.16–0.18	5.1–6.0	Low to moderate.
SC or SM	A-4 or A2	100	65–85	30–40	0.60–2.00	0.15–0.17	5.6–6.0	Low to moderate.
SM	A-2	100	60–80	15–30	6.0–0.0	0.08–0.10	5.6–6.5	Low.
ML or CL	A-4 or A-6	100	90–100	85–95	0.60–2.00	0.22–0.24	6.1–7.3	Low.
CL	A-6	100	95–100	85–95	0.06–0.20	0.18–0.20	6.1–7.3	Moderate.
CL or ML	A-6 or A-4	100	95–100	85–95	0.60–2.00	0.20–0.22	6.6–8.4	Low.
CL	A-6	100	95–100	85–95	0.20–0.60	0.21–0.23	6.6–7.3	Moderate.
CL	A-6	100	95–100	85–95	0.20–0.60	0.18–0.20	5.1–7.3	Moderate.
CL	A-6	100	95–100	85–95	0.20–0.60	0.18–0.20	5.1–6.0	Moderate.
ML or CL	A-4	100	90–100	70–90	0.60–2.00	0.22–0.24	6.1–7.3	Low.
CL or CH	A-6 or A-7	100	95–100	85–95	0.20–0.60	0.18–0.20	5.1–6.5	Moderate.
ML or CL	A-4 or A-6	100	95–100	70–95	0.60–2.00	0.20–0.22	6.6–8.4	Low.
ML or CL	A-4	100	90–100	70–90	0.60–2.00	0.21–0.23	5.1–7.3	Low.
CL	A-6	100	95–100	85–95	0.20–0.60	0.18–0.20	4.5–5.5	Moderate.
ML or CL	A-4 or A-6	100	90–100	75–95	<0.06	[10]0.06–0.08	4.5–5.5	Moderate.
ML or CL	A-4 or A-6	100	90–100	80–90	0.60–2.00	[10]0.06–0.08	4.5–5.5	Low.
ML	A-4	100	90–100	85–95	0.60–2.00	0.21–0.23	4.5–6.0	Low.
ML or CL	A-4 or A-6	100	90–100	85–95	0.60–2.00	0.21–0.23	5.6–6.0	Low.
CL	A-6	100	95–100	90–95	0.20–0.60	0.18–0.20	5.1–7.3	Moderate.
CL or CH	A-6 or A-7	100	95–100	95–100	0.20–0.60	0.12–0.15	7.4–8.4	Moderate.
ML	A-4	100	95–100	80–90	0.60–2.00	0.22–0.24	5.6–7.3	Low.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Frost-heave potential	Depth from surface	USDA texture
	Ft		*In*	
Weinbach: Wb	1–3	High	0–23	Silt loam and heavy silt loam
			23–46	Silty clay loam to light silty clay loam.
			46–57	Light silty clay loam
			57–65	Stratified light silty clay loam and silt loam that has lenses of very fine sand.
Wellston: WeD2, WeD3, WeE2, WeF	>6	Moderate	0–12	Silt loam
			12–35	Light silty clay loam
			35–48	Silt loam
			48–60	Bedrock.
Wheeling: WhA, WhB2	>6	Moderate	0–13	Loam
			13–45	Silty clay loam, clay loam, and sandy clay loam.
			45–70	Loam, fine sandy loam, and fine sand.
Wilbur: Wm	3–6	High	0–60	Silt loam
Woodmere: Wo	>6	Moderate	0–30	Silty clay loam
			30–82	Silty clay and silty clay loam
Zanesville: ZaC2, ZaC3, ZaD2, ZaD3	>6	High	0–6	Silt loam
			6–26	Light silty clay loam to heavy silt loam.
			26–50	Heavy silt loam to silt loam
			50–60	Silt loam and heavy silt loam
Zipp: Zp	[2]0–1	Moderate	0–64	Silty clay

[1]Fragipan limits water movement and root penetration.
[2]Ponded.
[3]To a depth of 30 inches.

significant to engineering—Continued

Classification		Percentage passing sieve—			Perme-ability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 10	No. 40	No. 200				
					In/hr	*In/in of soil*	*pH*	
ML or CL	A-4 or A-6	100	90–100	80–90	0.60–2.00	0.21–0.24	4.5–7.3	Low.
CL	A-4 or A-6	100	95–100	80–90	<0.06	[1]0.06–0.08	4.5–5.0	Moderate.
CL or ML	A-6 or A-4	100	90–100	70–95	0.20–0.60	[1]0.06–0.08	4.5–5.5	Low to moderate.
CL or ML	A-6 or A-4	100	85–95	70–90	0.60–2.00	[1]0.06–0.08	5.1–6.0	Low to moderate.
ML	A-4	100	90–100	80–95	0.60–2.00	0.22–0.24	4.5–5.5	Low.
CL	A-6	100	90–100	85–95	0.60–2.00	0.18–0.20	4.5–5.0	Moderate to low.
ML or CL	A-4 or A-6	100	75–85	65–75	0.60–2.00	0.20–0.22	4.5–5.0	Low.
ML	A-4	100	85–95	60–75	0.60–2.00	0.20–0.22	5.6–6.5	Low.
CL or SC	A-6	100	80–90	45–35	0.60–2.00	0.17–0.19	4.5–6.0	Low to moderate.
ML or SM	A-4	100	80–90	45–90	0.60–2.00	0.16–0.19	5.1–5.5	Low.
ML	A-4	100	95–100	80–95	0.60–2.00	0.21–0.23	5.6–7.3	Low.
CL	A-6	100	95–100	85–95	0.60–2.00	0.21–0.23	6.6–7.3	Moderate.
CL or CH	A-6 or A-7	100	95–100	85–95	0.20–0.60	0.18–0.20	5.1–6.0	Moderate.
ML	A-4	100	95–100	85–95	0.60–2.00	0.22–0.24	5.1–6.5	Low.
CL or ML	A-6 or A-4	100	95–100	85–95	0.60–2.00	0.18–0.20	4.5–5.5	Moderate.
ML or CL	A-4 or A-6	100	95–100	80–90	<0.06	[1]0.06–0.08	4.5–5.0	Low.
ML or CL	A-4 or A-6	95–100	75–85	65–75	0.60–2.00	[1]0.06–0.08	4.5–5.5	Low.
ML or CH	A-7	100	95–100	95–100	<0.06	0.19–0.21	[5]6.1–7.3 [6]7.4–7.8	High.

[4]Below a depth of 30 inches.
[5]To a depth of 43 inches.
[6]Below a depth of 43 inches.

TABLE 8.—*Interpretations of*

Soil series and map symbols	Suitability as a source of—			
	Topsoil	Sand and gravel	Road subgrade material	Highway location
Alford: AIB2, AIC2, AIC3, AID3.	Surface layer: fair if not eroded or too steep; low in content of organic matter. Subsoil: poor to fair; somewhat clayey; low in content of organic matter.	Not suitable	Subsoil and underlying material: poor; fair to poor shear strength; medium to high compressibility; fair to good compaction and stability.	Need for cuts and fills; erosion on side slopes; moderate potential frost action.
Bartle: Ba	Surface layer: fair; low in content of organic matter. Subsoil: poor; fragipan.	Not suitable	Subsoil and underlying material: poor; fair to poor shear strength; medium to high compressibility; fair compaction and stability; low to moderate shrink-swell potential.	Seasonal high water table; medium to high compressibility; moderate potential frost action.
Birds: Bd	Surface layer and underlying material: fair; low in content of organic matter; seasonal high water table.	Not suitable	Underlying material: fair to poor; poor stability and compaction; poor shear strength; low shrink-swell potential.	Seasonal high water table; subject to flooding; high potential frost action.
Bonnie: Bo	Surface layer and underlying material: fair; low in content of organic matter; seasonal high water table.	Not suitable	Underlying material: fair to poor; poor stability and compaction; poor shear strength; low shrink-swell potential.	Seasonal high water table; subject to flooding; high potential frost action.
Borrow pits: Br Too variable to be rated.				
Evansville: Ev	Surface layer: good. Subsoil: poor; somewhat clayey; seasonal high water table.	Not suitable	Subsoil and underlying material: poor; fair to poor shear strength; medium to high compressibility; moderate shrink-swell potential.	Seasonal high water table; high potential frost action.
Ginat: Gn	Surface layer: fair; low in content of organic matter. Subsoil: poor; fragipan; low in content of organic matter; seasonal high water table.	Not suitable	Subsoil and underlying material: fair to poor; fair to poor stability and compaction; medium compressibility; moderate shrink-swell potential; fair to poor shear strength.	Seasonal high water table; high potential frost action.
Gullied land: Gu. Too variable to be rated.				
Henshaw: He	Surface layer: fair; low in content of organic matter. Subsoil: poor; clayey.	Not suitable	Subsoil and underlying material: poor, medium to high compressibility; fair to poor shear strength; moderate to high shrink-swell potential.	Seasonal high water table; high potential frost action.

engineering properties of the soils

Soil features affecting—				
Dikes, levees, and other embankments	Pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways
Subsoil and underlying material: fair to good stability and compaction; low to medium permeability when compacted; medium to high compressibility; fair resistance to piping; low to moderate shrink-swell potential.	Well drained; moderate seepage rate.	Natural drainage is adequate; not needed.	Soil features favorable where slopes do not exceed 12 percent.	Soil features favorable.
Subsoil and underlying material: low to medium permeability when compacted; medium compressibility; fair resistance to piping; low to moderate shrink-swell potential.	Seasonal high water table; very slowly permeable fragipan; nearly level.	Seasonal high water table; very slowly permeable fragipan.	Not generally needed; nearly level.	Not generally needed; nearly level.
Underlying material: fair to poor stability and compaction; poor resistance to piping; medium permeability when compacted; low shrink-swell potential.	Seasonal high water table; subject to seepage and flooding.	Seasonal high water table; outlets for tile usually inadequate; subject to flooding.	Not generally needed; nearly level.	Not generally needed; nearly level.
Underlying material: fair to poor stability and compaction; poor resistance to piping; medium permeability when compacted; low shrink-swell potential.	Seasonal high water table; subject to seepage and flooding.	Seasonal high water table; outlets for tile usually not adequate; subject to flooding.	Not generally needed nearly level.	Not generally needed; nearly level.
Subsoil and underlying material: fair stability and compaction; moderate shrink-swell potential; good resistance to piping; slow permeability when compacted; moderate shrink-swell potential.	Moderate seepage rate: seasonal high water table.	Seasonal high water table.	Not generally needed; nearly level.	Not generally needed; nearly level.
Subsoil and underlying material: fair to poor stability and compaction; medium compressibility; slow permeability when compacted; fair to good resistance to piping; moderate shrink-swell potential.	Seasonal high water table; slow seepage rate.	Seasonal high water table; very slowly permeable fragipan.	Not generally needed; nearly level.	Not generally needed; nearly level.
Subsoil and underlying material: fair to poor stability and compaction; moderate to high shrink-swell potential; low to medium permeability when compacted; fair resistance to piping.	Seasonal high water table; moderately slow permeability.	Seasonal high water table; moderately slow permeability.	Not generally needed; nearly level.	Not generally needed; nearly level.

TABLE 8.—*Interpretations of*

Soil series and map symbols	Suitability as a source of—			
	Topsoil	Sand and gravel	Road subgrade material	Highway location
Hosmer: HoA, HoB2, HoB3, HoC2, HoC3, HoD3.	Surface layer: fair if not eroded or too steep; low in content of organic matter. Subsoil: poor; very slowly permeable fragipan.	Not suitable	Subsoil and underlying material: fair to poor shear strength; fair stability and compaction; moderate to low shrink-swell potential.	Need for cuts and fills; erosion on side slopes; moderate potential frost action.
Huntington: Ht, Hu	Surface layer: fair to good. Subsoil: fair to poor; somewhat clayey.	Not suitable	Subsoil and underlying material: fair; poor stability and compaction; medium compressibility; fair to poor shear strength; moderate to low shrink-swell potential.	Subject to flooding; moderate potential frost action.
Iona: IoA, IoB2	Surface layer: good. Subsoil: poor to fair; somewhat clayey.	Not suitable	Subsoil and underlying material: fair to poor; fair stability and compaction; fair to poor shear strength; medium compressibility.	Need for cuts and fills on slopes; moderate potential frost action.
Iva: Iv	Surface layer: good. Subsoil: fair to poor; somewhat clayey.	Not suitable	Subsoil and underlying material: fair to poor; fair stability and compaction; fair to poor shear strength; medium compressibility.	Occasional high water table; high potential frost action.
Lindside: Ln	Surface layer: fair; clayey. Subsoil: poor; somewhat clayey; moderate in content of organic matter.	Not suitable	Subsoil and underlying material: fair to poor; moderate to low shrink-swell potential; fair to poor shear strength; fair stability.	Subject to flooding; high potential frost action.
Made land: Ma. Too variable to be rated.				
Markland: MkB2, MkC2, MlC3.	Surface layer: fair; thin; poor if eroded. Subsoil: poor; clayey.	Not suitable	Subsoil and underlying material: poor; high shrink-swell potential; poor shear strength; fair to poor compressibility and compaction.	Plastic soil material; cuts and fills needed; moderate potential frost action.
McGary: Mr	Surface layer: fair; low in content of organic matter. Subsoil: poor, clayey.	Not suitable	Subsoil and underlying material: poor; high shrink-swell potential; poor shear strength; fair to poor stability and compaction.	Seasonal high water table; plastic soil material; high shrink-swell potential; moderate potential frost action.
Muren: MuA, MuB2	Surface layer: good. Subsoil: poor to fair; somewhat clayey.	Not suitable	Subsoil and underlying material: fair to poor; fair stability and compaction; fair to poor shear strength; medium compressibility.	Need for cuts and fills on slopes; moderate potential frost action.

engineering properties of the soils—Continued

Soil features affecting—				
Dikes, levees, and other embankments	Pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways
Subsoil and underlying material: fair stability and compaction; low to medium permeability when compacted; fair resistance to piping; moderate to low shrink-swell potential.	Slow seepage rate	Natural drainage is adequate; not needed.	Very slowly permeable fragipan.	Very slowly permeable fragipan.
Subsoil and underlying material: poor stability and compaction; medium compressibility; moderate to low shrink-swell potential; poor resistance to piping.	Moderate to moderately rapid seepage rate; subject to flooding.	Natural drainage is adequate; not needed.	Not needed; nearly level	Not needed; nearly level.
Subsoil and underlying material: fair stability and compaction; low to medium permeability when compacted; fair resistance to piping; moderate to low shrink-swell potential.	Moderate seepage rate in underlying material.	Natural drainage is adequate; not needed.	Soil feaures favorable	Soil features favorable.
Subsoil and underlying material: fair stability and compaction; fair resistance to piping; low to medium permeability when compacted; moderate to low shrink-swell potental.	Seasonal high water table; slow seepage rate.	Seasonal high water table; slow seepage rate.	Not generally needed; nearly level.	Not generally needed; nearly level.
Subsoil and underlying material: low to medium permeability when compacted; poor stability and compaction; poor resistance to piping; moderate to low shrink-swell potential.	Moderate seepage rate; subject to flooding.	Natural drainage is adequate; not needed.	Not needed; nearly level.	Not needed; nearly level.
Subsoil and underlying material: fair to poor stability and compaction; good resistance to piping; high shrink-swell potential.	Slow seepage rate	Natural drainage is adequate; not needed.	Many short, irregular slopes.	Difficult to establish vegetative cover.
Subsoil and underlying material: fair to poor stability and compaction; high shrink-swell potential; good resistance to piping.	Seasonal high water table; slow seepage rate.	Seasonal high water table; slow permeability.	Not generally needed; nearly level.	Not generally needed; nearly level.
Subsoil and underlying material: fair stability and compaction; low to medium permeability when compacted; fair resistance to piping; moderate to low shrink-swell potential.	Moderate seepage rate in underlying material.	Natural drainage is adequate; not needed.	Soil features favorable	Soil features favorable.

TABLE 8.—*Interpretations of*

Soil series and map symbols	Suitability as a source of—			
	Topsoil	Sand and gravel	Road subgrade material	Highway location
Newark: Nw	Surface layer: fair; moderate content of organic matter; clayey.	Not suitable	Underlying material: poor; moderate shrink-swell potential; medium compressibility; poor shear strength.	Seasonal high water table; subject to flooding; high potential frost action.
Patton: Pa	Surface layer: fair; high content of organic matter; clayey. Subsoil: poor; clayey.	Not suitable	Subsoil and underlying material: poor; fair to poor shear strength; medium to high compressibility; moderate shrink-swell potential.	Seasonal high water table; high potential frost action.
Princeton: PrB	Surface layer: fair; moderate available water capacity. Subsoil: poor; clayey and sandy.	Poor: minor amounts in stratified soil.	Subsoil: poor; fair to good stability and compaction; medium compressibility; low to moderate shrink-swell potential. Underlying material: good; poor to fair stability; fair to good compaction; low shrink-swell potential.	Cuts and fills needed; erosion hazard on side slopes; moderate potential frost action.
Ragsdale: Ra	Surface layer: good. Subsoil: poor; clayey.	Not suitable	Subsoil and underlying material: fair to poor; fair stability and compaction; medium compressibility; fair to poor shear strength.	Seasonal high water table; high potential frost action.
Rahm: Rh	Surface layer: fair; moderate content of organic matter; clayey.	Not suitable	Underlying material: poor; moderate shrink-swell potential; medium compressibility; poor shear strength.	Seasonable high water table; subject to flooding; high potential frost action.
Reesville: Rs	Surface layer: good. Subsoil: fair to poor; somewhat clayey.	Not suitable	Subsoil and underlying material: fair to poor; fair stability and compaction; fair to poor shear strength; medium compressibility.	Seasonal high water table; high potential frost action.
Sciotoville: ScA, ScB2.	Surface layer: good. Subsoil: poor; fragipan.	Not suitable	Subsoil and underlying material: poor; fair to poor shear strength; fair stability and compaction; medium to high compressibility; moderate to low shrink-swell potential.	Low to moderate potential frost action.

engineering properties of the soils—Continued

Soil features affecting—				
Dikes, levees, and other embankments	Pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways
Underlying material: fair stability and compaction; moderate shrink-swell potential; fair to good resistance to piping.	Seasonal high water table; subject to flooding; moderate seepage rate.	Seasonal high water table; subject to flooding.	Not needed; nearly level	Not needed; nearly level.
Subsoil and underlying material: fair stability and compaction; moderate shrink-swell potential; good resistance to piping; slow permeability when compacted	Moderate seepage rate; seasonal high water table.	Seasonal high water table; moderately permeable.	Not generally needed; nearly level.	Not generally needed; nearly level.
Subsoil: fair to good stability and compaction; low to moderate shrink-swell potential; medium compressibility; good resistance to piping. Underlying material: poor to fair stability; fair compaction; moderate to high permeability; slight compressibility; poor resistance to piping.	Not suitable: some layers are rapidly permeable in the underlying material.	Natural drainage is adequate; not needed.	Short, irregular slopes	Soil features favorable.
Subsoil and underlying material: fair stability and compaction; medium to high compressibility; low to moderate shrink-swell potential; medium to low permeability when compacted; fair resistance to piping.	Seasonal high water table; slow seepage rate; moderate seepage rate in underlying material.	Seasonal high water table; subject to ponding; slowly permeable.	Not needed; nearly level	Not needed; nearly level.
Underlying material: fair stability and compaction; moderate shrink-swell potential; fair to good resistance to piping.	Seasonal high water table; subject to flooding.	Seasonal high water table; subject to flooding.	Not needed; nearly level	Not needed; nearly level.
Subsoil and underlying material: fair stability and compaction; fair resistance to piping; medium to low permeability when compacted; moderate to low shrink-swell potential.	Seasonable high water table; moderately slow seepage rate.	Seasonal high water table; moderately slowly permeable.	Not generally needed; nearly level.	Not generally needed; nearly level.
Subsoil and underlying material: fair stability and compaction; fair resistance to piping; low to medium permeability when compacted; fair resistance to piping.	Moderate seepage rate below the fragipan.	Generally not needed; moderately well drained.	Very slowly permeable fragipan.	Very slowly permeable fragipan.

TABLE 8.—*Interpretations of*

Soil series and map symbols	Suitability as a source of— Topsoil	Sand and gravel	Road subgrade material	Highway location
Stendal: St	Surface layer and underlying material: fair; low content of organic matter.	Not suitable	Underlying material: fair; poor stability and compaction; slight to medium compressibility; fair to poor shear strength; low shrink-swell potential.	Subject to flooding; seasonal high water table; high potential frost action.
Uniontown: UnB2	Surface layer: fair; low content of organic matter. Subsoil: poor; clayey.	Not suitable	Subsoil and underlying material: poor; fair to good stability and compaction; medium to high compressibility; moderate shrink-swell potential.	Cuts and fills needed; erosion hazard on side slopes; moderate potential frost action.
Wakeland: Wa	Surface layer: good. Underlying material: fair; moderate content of organic matter.	Not suitable	Underlying material: fair; poor stability and compaction; slight to medium compressibility; fair to poor shear strength; low shrink-swell potential.	Subject to flooding; seasonal high water table; high potential frost action.
Weinbach: Wb	Surface layer: good. Subsoil: poor; fragipan.	Not suitable	Subsoil and underlying material: fair to poor; fair to poor stability and compaction; medium compressibility; moderate to low shrink-swell potential.	Seasonal high water table; high potential frost action.
Wellston: WeD2, WeD3, WeE2, WeF	Surface layer: fair if not eroded or too steep. Subsoil: poor; somewhat clayey; steep slope.	Not suitable	Subsoil and underlying material: poor; bedrock at a depth of 40 to 60 inches; fair stability and compaction; moderate to low shrink-swell potential.	Need for cuts and fills; erosion hazard on side slopes; bedrock at a depth of 40 to 60 inches; moderate potential frost action.
Wheeling: WhA, WhB2.	Surface layer: good. Subsoil: fair to poor; somewhat clayey.	Poor: small amount of sand.	Subsoil: poor; fair to good stability and compaction; medium compressibility; moderate to low shrink-swell potential. Underlying material: fair; poor to fair stability; fair to good compaction; low shrink-swell potential; moderate potential frost action.	Soil features favorable; moderate potential frost action.

engineering properties of the soils—Continued

Soil features affecting—				
Dikes, levees, and other embankments	Pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways
Underlying material: poor stability and compaction; low shrink-swell potential; medium permeability when compacted; poor resistance to piping.	Seasonal high water table; subject to flooding; subject to seepage.	Seasonal high water table; subject to flooding.	Not needed; nearly level	Not needed; nearly level.
Subsoil and underlying material: fair to good stability and compaction; medium to high compressibility; slow permeability when compacted; good resistance to piping; moderate shrink-swell potential.	Soil features favorable	Generally not needed; well-drained soil.	Generally not needed; short slopes.	Soil features favorable.
Underlying material: poor stability and compaction; low shrink-swell potential; medium permeability when compacted; poor resistance to piping.	Seasonal high water table; subject to flooding; subject to seepage.	Seasonal high water table; subject to flooding.	Not needed; nearly level	Not needed; nearly level.
Subsoil and underlying material: fair to poor stability and compaction; medium compressibility; medium to slow permeability when compacted; fair resistance to piping; moderate to low shrink-swell potential.	Seasonal high water table; slow seepage rate.	Very slowly permeable fragipan; seasonal high water table.	Not generally needed; nearly level.	Not generally needed; nearly level.
Subsoil and substratum; fair stability and compaction; medium compressiblity; medium permeability when compacted; poor to fair resistance to piping; moderate to low shrink-swell potential.	Moderate seepage rate; bedrock at a depth of 40 to 60 inches.	Natural drainage is adequate; not needed.	Bedrock at a depth of 40 to 60 inches; slopes of more than 12 percent.	Bedrock at a depth of 40 to 60 inches.
Subsoil: fair to good stability and compaction; medium compressibility; medium to low permeability when compacted; fair resistance to piping; moderate to low shrink-swell potential. Underlying material: poor to fair stability; fair to good compaction characteristics; slight compressibility; medium to high permeability when compacted; poor resistance to piping.	Moderate to rapid seepage rate.	Natural drainage is adequate; not needed.	No limitations if topography is favorable.	Soil features favorable.

TABLE 8.—*Interpretations of*

Soil series and map symbols	Suitability as a source of—			
	Topsoil	Sand and gravel	Road subgrade material	Highway location
Wilbur: Wm	Surface layer: good. Underlying material: fair; moderate content of organic matter.	Not suitable	Underlying material: fair; poor stability and compaction; low shrink-swell potential; medium compressibility.	Subject to flooding; high potential frost action.
Woodmere: Wo	Surface layer: fair; somewhat clayey. Subsoil: poor; clayey.	Not suitable	Subsoil and underlying material: fair to poor; fair stability and compaction; medium compressibility; moderate shrink-swell potential; fair to poor shear strength.	Subject to flooding; moderate potential frost heave.
Zanesville: ZaC2, ZaC3, ZaD2, ZaD3.	Surface layer: fair if not eroded or too steep; low content of organic matter. Subsoil: poor; very slow permeable; fragipan.	Not suitable	Subsoil and underlying material: poor; fair to poor shear strength; fair stability and compaction; moderate to low shrink-swell potential.	Need for cuts and fills; erosion on side slopes; high potential frost action.
Zipp: Zp	Surface layer and subsoil: poor; clayey.	Not suitable	Subsoil and underlying material: poor; fair to poor stability and compaction; high compressibility; high shrink-swell potential; poor shear strength.	Seasonal high water table; subject to ponding; high shrink-swell potential; moderate potential frost action.

engineering properties of the soils—Continued

Soil features affecting—				
Dikes, levees, and other embankments	Pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways
Underlying material: poor stability and compaction; low shrink-swell potential; medium permeability when compacted; poor resistance to piping.	Subject to flooding; subject to seepage.	Natural drainage is adequate; drainage generally not needed.	Not needed; nearly level	Not needed; nearly level.
Subsoil and underlying material: fair stability and compaction; slow permeability when compacted; moderate shrink-swell potential; good resistance to piping.	Subject to flooding	Natural drainage is adequate; drainage generally not needed.	Not needed; nearly level	Not needed; nearly level.
Subsoil and underlying material: fair stability and compaction; low to medium permeability when compacted; fair resistance to piping; moderate to low shrink-swell potential.	Slow seepage rate	Natural drainage is adequate; not needed.	Very slowly permeable fragipan.	Very slowly permeable fragipan.
Subsoil and underlying material: fair to poor stability and compaction; high compressibility; high shrink-swell potential; low permeability when compacted; good resistance to piping.	Seasonal high water table; subject to ponding; slow seepage rate.	Very slowly permeable; seasonal high water table.	Not needed; nearly level	Not needed; nearly level.

Planning officials and developers, as well as homeowners and others, can find useful information in the soil maps, in the text, and in the tables in this survey. The detailed soil maps in the back of the survey are useful because they show the location of each of the soils in the county. The colored general soil map that precedes the detailed soil map shows the pattern of the major soils within the county. All of the soils are discussed in detail in the section "Descriptions of the Soils."

The soils are evaluated for town and country planning only to a depth of five feet or less. Soils are rated on the basis of three classes of soil limitations. A rating of *slight* means that, for the intended use, it is relatively free of limitations and the facility is easily created, improved, or maintained. A rating of *moderate* means that limitations need to be recognized, but that they can be overcome with good management and careful design. A rating of *severe* means that limitations are severe enough to make use questionable and extreme measures are needed to overcome such limitations (fig. 37).

In the paragraphs that follow, each town and country planning use is defined, and the properties important in rating the limitations for such purposes are given. The information can be used, along with table 9 and with information in other parts of the survey, as a guide in the use of soils data for town and country planning. Before beginning any construction projects, however, an investigation should be made at the site being considered.

Residential or light industrial development.—Interpretations are for buildings of three stories or less. Soils are important in the construction and maintenance of building foundations and basements. The cost of excavation, the bearing strength of the foundation, and the drainage around the basement depend upon the soil. The properly constructed basement will not only support the building without undue settling and cracking but will also be dry throughout the year. Sound construction techniques should provide adequate drainage around the foundation or footing to prevent undue settlement and wet basements. Soil characteristics affecting homesites or commercial sites include depth to the seasonal high water table, slope, depth to bedrock, flooding or ponding hazard, compressibility, shear strength, and shrink-swell potential. In determining the degree of limitations for residential or industrial developments, disposal of effluent from septic tanks was not considered.

Septic-tank absorption fields.—Septic tanks along with an absorption field are used to dispose of sewage where central sewage facilities are unavailable. A well-designed system consists of a septic tank for holding solid wastes, a distribution box for dispensing effluent, and a tile disposal field. Successful operation of the entire system depends upon the ability of the soil to absorb and filter the liquid effluent that passes through the tile field. Soil characteristics that cause the soil material to impair proper absorption and filtering of the effluent will cause health hazards as well as public nuisance situations. Soil characteristics affecting the operation of the tile absorption field include depth to the seasonal high water table, slope, depth to bedrock, flooding or ponding hazard, and permeability.

Landscaping and lawns.—The establishment of lawns and shrubs is important in most residential areas and around many commercial areas. Some soil characteristics are limitations for landscaping and lawns but are not limitations for building purposes. Frequently, landscaping problems can be overcome or dealt with once the soil problem is understood. The soil characteristics affecting the establishment and maintenance of lawns and shrubs are available water capacity, droughtiness, erodibility, slope, flooding or ponding hazard, and depth to the seasonal high water table.

Local roads, streets, and parking lots.—Interpretations are for improved roads, streets, and parking lots that carry automobile traffic throughout the year. Roads, streets, and

***Figure 37.*—Housing development on Hosmer silt loam. This well-drained soil has a very slowly permeable fragipan that creates a severe limitation for the use of septic-tank absorption fields. Public sewer systems are needed.**

parking lots consist of the subgrade, which is the underlying local soil material, either cut or fill; the base material of gravel, crushed rock, or lime or soil cement stabilized soil; and the pavement, which is the actual road surface, generally asphalt or concrete. The subgrades for roads, streets, and parking lots are built mainly from the soil at hand, and cuts and fills generally are limited to a depth of less than six feet. Soil characteristics that affect construction include depth to the seasonal high water table, slope, depth to bedrock, flooding or ponding hazard, shrink-swell potential, and susceptibility to frost heave.

Sanitary landfills.—These are disposal areas for trash and garbage. The soils are rated for the trench method of landfill, a method in which the hauling of cover material is unnecessary. A well-managed sanitary landfill will not contaminate water supplies, reduce esthetic values, or cause health hazards; and it will be usable during all seasons of the year. Fill areas that have been adequately compacted and covered can be used for parking areas, parks, recreation areas, and other important purposes. Soil characteristics affecting the operation of a sanitary landfill include depth to the seasonal high water table, slope, depth to bedrock, flooding or ponding hazard, soil texture, and permeability.

Routine soil investigations generally are confined to depths of about 5 to 6 feet, but many landfill operations use trenches as deep as 15 feet or more. Geologic investigation of the area is needed, therefore, to determine the potential for pollution of ground water as well as to determine the design of the landfill. The soil survey is a valuable aid in selecting potential sites and determining where additional investigations appear warranted.

Waste-stabilization lagoons.—These are shallow lakes that are used to hold sewage during the time required for bacterial decomposition. A suitable site should provide an impoundment area and enough soil material to make a dam structure. The completed lagoon must be able to hold water with minimum seepage and without contamination of water supplies. Soil characteristics affecting sewage lagoons are depth to the seasonal high water table, slope, depth to bedrock, coarse fragments, flooding or ponding hazard, permeability, and organic-matter content.

Formation and Classification of the Soils

This section consists of two main parts. The first part tells how the factors of soil formation have affected the development of soils in Vanderburgh County. The second explains the system of soil classification currently used and places each soil series in classes of that system. Laboratory data for soils of the Evansville and Huntington series are presented at the end of the section.

Factors of Soil Formation

Soil is produced by soil-forming processes acting on materials deposited or accumulated by geologic forces. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors in soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that is formed and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil. It may be much or little, but some time is always required for horizon differentiation. Generally, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil development are unknown.

Parent material

The parent material from which the soils of Vanderburgh County formed consists of residuum from sandstone and shale, deposits of lacustrine, and alluvium of the Wisconsin age, and loess of the Pleistocene age. The glacial boundary or limit of the old Illinoian drift cuts across the extreme northwestern part of the county, where it has formed valleys filled with lakebed sediment and capped with loess. Soils of the Patton, Evansville, Ragsdale, and Reesville series formed in these silty lacustrine and loess deposits.

The geological formations underlying the rugged and rolling uplands belong to the Pennsylvanian period. These formations, generally sandstone and shale, have a dip of approximately 25 feet per mile to the southwest. Soils of the Wellston series formed mainly in material that weathered from sandstone and shale.

In the south, along tributary streams of the Ohio River, lacustrine terraces are in the valleys. Soils of the Markland, Henshaw, McGary, and Zipp series formed in these lacustrine deposits. Along the Ohio River are terraces that formed from stream-deposited sand and gravel. Soils of the Wheeling and Weinbach series formed on these terraces. All of these terraces formed as a result of the increase in size of the Ohio River which was caused by melting of continental glaciers in the Ohio River basin during the Pleistocene epoch.

During the Pleistocene epoch, a blanket of Peoria loess (windblown silt) was deposited over the county. The loess is as much as 20 feet thick in the southwestern and western parts of the county, and it is thinner in the eastern parts where it is generally 4 to 5 feet thick on ridgetops. Soils of the Alford and Hosmer series are representative of those that formed in deep deposits of loess. Zanesville soils formed in a thinner loess cap and the underlying residuum that weathered from sandstone and shale.

Climate

The climate of Vanderburgh County is midcontinental, and great contrasts in temperature occur. The average daily maximum temperature is 90° F in July, and the average daily minimum temperature is 26° in January.

Rainfall is moderately heavy, or an average of 41.6 inches annually. It is well distributed throughout the year but is slightly heavier in spring and summer than in fall and winter. The large amount of rainfall has leached plant nutrients from the soil and has prevented the accumulation of free calcium carbonate.

TABLE 9.—*Degree and kind of limitations of the*

Soil series and map symbols	Estimated degree of limitations for—	
	Residential or light industrial development[1]	Septic tank absorption fields
Alford: AlB2	Slight	Slight: moderate permeability; estimated percolation rate faster than 45 minutes per inch.
AlC2	Moderate: moderately sloping; some excavation generally required.	Moderate: slope hinders design of septic system; moderate permeability; estimated percolation rate faster than 45 minutes per inch.
AlC3	Moderate: severely eroded; moderately sloping; some excavation generally required	Moderate: slope hinders design of septic system; moderate permeability; estimated percolation rate faster than 45 minutes per inch.
AlD3	Severe: slope severely hinders development of site.	Severe: slope severely hinders design of septic system
Bartle: Ba	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet.	Severe: very slow permeability; seasonal high water table at a depth of 1 to 3 feet; estimated percolation rate slower than 60 minutes per inch.
Birds: Bd	Severe: subject to flooding	Severe: subject to flooding
Bonnie: Bo	Severe: subject to flooding	Severe: subject to flooding
Borrow pits: Br. Too variable to be rated.		
Evansville: Ev	Severe: poorly drained; subject to ponding; seasonal high water table.	Severe: seasonal high water table; poorly drained; subject to ponding.
Ginat: Gn	Severe: poorly drained; seasonal high water table.	Severe: poorly drained; seasonal high water table at a depth of 0 to 1 foot (above a very slowly permeable fragipan).
Gullied land: Gu. Too variable to be rated.		
Henshaw: He	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet.	Severe: seasonal high water table at a depth of 1 to 3 feet; moderately slow permeability; estimated percolation rate slower than 60 minutes per inch.
Hosmer: HoA	Slight	Severe: very slow permeability; depth to fragipan ranges from 25 to 36 inches.
HoB2	Slight	Severe: very slow permeability; depth to fragipan ranges from 25 to 36 inches.
HoB3	Slight	Severe: very slow permeability; depth to fragipan ranges from 25 to 36 inches.
HoC2	Moderate: moderately sloping; some excavation generally required.	Severe: very slow permeability; depth to fragipan ranges from 25 to 36 inches.
HoC3	Moderate: moderately sloping; some excavation generally required.	Severe: very slow permeability; depth to fragipan ranges from 25 to 36 inches.

soils for town and country planning.

Estimated degree of limitations for—Continued			
Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Waste-stabilization lagoons
Slight	Slight for roads; moderate for parking lots; slope hinders development of site.	Slight	Moderate: slope hinders development of site; moderate permeability; silty material moderately suited to embankments; moderate hazard of effluent seepage.
Slight	Moderate for roads; severe for parking lots; slope hinders development.	Slight	Severe: slope severely hinders development of site.
Moderate: severely eroded	Moderate for roads; severe for parking lots; slope hinders development.	Slight	Severe: slope severely hinders development of site.
Severe: severely eroded; strongly sloping.	Severe: slope severely hinders development of site.	Moderate: slope moderately hinders development of site.	Severe: slope severely hinders development of site.
Moderate: seasonal high water table; some shrubs not adapted; lawns damaged if used during wet periods.	Moderate: seasonal high water table.	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet.	Moderate: somewhat poorly drained; seasonal high water table above a very slowly permeable fragipan.
Severe: subject to flooding	Severe: subject to flooding; poorly drained.	Severe: subject to flooding	Severe: subject to flooding.
Severe: subject to flooding	Severe: subject to flooding; poorly drained.	Severe: subject to flooding	Severe: subject to flooding.
Severe: seasonal high water table; subject to ponding; poorly drained.	Severe in depressions; subject to ponding; seasonal high water table; poorly drained.	Severe in depressions; subject to ponding; seasonal high water table; poorly drained.	Severe: poorly drained; seasonal high water table at a depth of 0 to 1 foot or ponded.
Severe: seasonal high water table; subject to ponding; poorly drained.	Severe: seasonal high water table at a depth of 0 to 1 foot; poorly drained.	Severe: poorly drained; seasonal high water table above a very slowly permeable fragipan.	Severe: poorly drained; seasonal high water table above a very slowly permeable fragipan.
Moderate: seasonal high water table; lawns damaged if used during wet periods.	Moderate: seasonal high water table.	Moderate: seasonal high water table at a depth of 1 to 3 feet; somewhat poorly drained.	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet.
Slight	Moderate: fair stability	Slight	Slight.
Slight	Moderate: fair stability; some excavation needed for parking lots.	Slight	Moderate: slope.
Moderate: severely eroded	Moderate: fair stability; some excavation needed for parking lots.	Slight	Moderate: slope.
Slight	Moderate for roads; severe for parking lots.	Slight	Severe: slope.
Moderate: severely eroded	Moderate: for roads; severe for parking lots; slope.	Slight	Severe: slope.

TABLE 9.—*Degree and kind of limitations of the*

Soil series and map symbols	Estimated degree of limitations for—	
	Residential or light industrial development[1]	Septic tank absorption fields
Hosmer (con.):		
HoD3	Severe: slope	Severe: slope severely hinders design of septic system; very slow permeability; estimated percolation rate slower than 60 minutes per inch.
Huntington: Ht, Hu	Severe: subject to flooding	Severe: subject to flooding
Iona:		
IoA	Moderate: low strength	Severe: moderately slow permeability; estimated percolation rate slower than 60 minutes per inch.
IoB2	Moderate: low strength	Severe: moderately slow permeability; estimated percolation rate slower than 60 minutes per inch.
Iva: Iv	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet.	Severe: seasonal high water table at a depth of 1 to 3 feet; slow permeability; estimated percolation rate slower than 60 minutes per inch.
Lindside: Ln	Severe: subject to flooding	Severe: subject to flooding
Made land: Ma. Too variable to be rated.		
Markland:		
MkB2	Moderate: low strength	Severe: slow permeability, estimated percolation rate slower than 60 minutes per inch.
MkC2	Moderate: 6 to 12 percent slopes; low bearing strength. Severe: 12 to 18 percent slopes.	Severe: slow permeability, estimated percolation rate slower than 60 minutes per inch.
MlC3	Moderate: 6 to 12 percent slopes; low bearing strength. Severe: 12 to 18 percent slopes.	Severe: slow permeability, estimated percolation rate slower than 60 minutes per inch.
McGary: Mr	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet.	Severe: seasonal high water table at a depth of 1 to 3 feet; slow permeability; estimated percolation rate slower than 60 minutes per inch.
Muren:		
MuA	Moderate: low strength	Severe: moderately slow permeability; estimated percolation rate slower than 60 minutes per inch.
MuB2	Moderate: low strength	Severe: moderately slow permeability; estimated percolation rate slower than 60 minutes per inch.
Newark: Nw	Severe: subject to flooding	Severe: subject to flooding
Patton: Pa	Severe: poorly drained; subject to ponding; seasonal high water table.	Severe: seasonal high water table; poorly drained; subject to ponding
Princeton: PrB	Slight	Slight: possible pollution of nearby shallow wells

soils for town and country planning—Continued

Estimated degree of limitations for—Continued			
Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Waste-stabilization lagoons
Severe: severely eroded; strongly sloping.	Severe: slope	Moderate: slope	Severe: slope.
Moderate: subject to flooding; flood waters may damage landscape plantings.	Moderate: subject to flooding	Severe: subject to flooding	Severe: subject to flooding.
Slight	Moderate: poor stability when wet.	Slight	Moderate: permeability moderately slow to a depth about 4½ feet and moderate below.
Slight	Moderate: poor stability when wet; slope hinders development of parking lots.	Slight	Moderate: slope.
Moderate: seasonal high water table; lawns damaged if used during wet periods.	Moderate: seasonal high water table.	Moderate: seasonal high water table at a depth of 1 to 3 feet; somewhat poorly drained.	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet.
Moderate: subject to flooding; floodwater damages landscape plantings in places.	Moderate: subject to flooding	Severe: subject to flooding	Severe: subject to flooding.
Slight	Moderate: high shrink-swell potential; poor shear strength.	Severe: clay and silty clay severely affect workability.	Moderate: slope.
Slight	Moderate for roads; severe for parking lots; slope.	Severe: clay and silty clay severely affect workability.	Severe: slope.
Moderate: severely eroded	Moderate for roads; severe for parking lots; slope.	Severe: clay and silty clay severely affect workability.	Severe: slope.
Moderate: seasonal high water table; some shrubs not adapted; lawns damaged if used during wet periods.	Moderate: seasonal high water table; soft when wet.	Severe: silty clay severely affects workability.	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet.
Slight	Moderate: poor stability when wet.	Slight	Moderate: permeability moderately slow to a depth of about 4½ feet and moderate below.
Slight	Moderate: poor stability when wet; slope hinders development of parking lots.	Slight	Moderate: slope.
Severe: subject to flooding; seasonal high water table; somewhat poorly drained.	Severe: subject to flooding; somewhat poorly drained; seasonal high water table.	Severe: subject to flooding	Severe: subject to flooding.
Severe: seasonal high water table; subject to ponding; poorly drained.	Severe in depressions; subject to ponding; seasonal high water table; poorly drained.	Severe in depressions; subject to ponding; seasonal high water table; poorly drained.	Severe: poorly drained; seasonal high water table at a depth of 0 to 1 foot or ponded.
Moderate: somewhat droughty.	Slight for roads; moderate for parking lots; slope.	Severe: rapidly permeable stratified sand at a depth of less than 5 feet; hazard of leachate flow to ground water.	Moderate: slope; moderate hazard of effluent seepage.

TABLE 9.—*Degree and kind of limitations of the*

Soil series and map symbols	Estimated degree of limitations for—	
	Residential or light industrial development[1]	Septic tank absorption fields
Ragsdale: Ra	Severe: very poorly drained; subject to ponding; seasonal high water table.	Severe: seasonal high water table; very poorly drained; subject to ponding; slow permeability; estimated percolation rate slower than 60 minutes per inch.
Rahm: Rh	Severe: subject to flooding	Severe: subject to flooding
Reesville: Rs	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet.	Severe: seasonal high water table at a depth of 1 to 3 feet; moderately slow permeability; estimated percolation rate slower than 60 minutes per inch.
Sciotoville: ScA	Slight	Severe: very slow permeability; depth to fragipan ranges from 25 to 36 inches.
ScB2	Slight	Severe: very slow permeability; depth to fragipan ranges from 25 to 36 inches.
Stendal: St	Severe: subject to flooding	Severe: subject to flooding
Uniontown: UnB2	Slight	Severe: moderately slow permeability; estimated percolation rate slower than 60 minutes per inch.
Wakeland: Wa	Severe: subject to flooding	Severe: subject to flooding
Weinbach: Wb	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet.	Severe: seasonal high water table at a depth of 1 to 3 feet; very slow permeability, estimated percolation rate slower than 75 minutes per inch.
Wellston: WeD2, WeD3, WeE2, WeF	Severe: steep slopes severely hinder development of site.	Severe: steep slopes severely hinder design of septic system
Wheeling: WhA	Slight	Slight: possible pollution of nearby shallow wells.
WhB2	Slight	Slight: possible pollution of nearby shallow wells.
Wilbur: Wm	Severe: subject to flooding	Severe: subject to flooding
Woodmere: Wo	Severe: subject to flooding	Severe: subject to flooding
Zanesville: ZaC2	Moderate: moderately sloping; some excavation generally required.	Severe: very slow permeability; depth to fragipan ranges from 25 to 36 inches.

soils for town and country planning—Continued

Estimated degree of limitations for—Continued			
Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Waste-stabilization lagoons
Severe: seasonal high water table; subject to ponding; very poorly drained.	Severe in depressions; subject to ponding; seasonal high water table; very poorly drained.	Severe in depressions; subject to ponding; seasonal high water table; very poorly drained.	Severe: very poorly drained; seasonal high water table at a depth of 0 to 1 foot or ponded.
Severe: subject to flooding; seasonal high water table; somewhat poorly drained.	Severe: subject to flooding; somewhat poorly drained; seasonal high water table.	Severe: subject to flooding	Severe: subject to flooding.
Moderate: seasonal high water table; lawns damaged if used during wet periods.	Moderate: seasonal high water table.	Moderate: seasonal high water table at a depth of 1 to 3 feet; somewhat poorly drained.	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet.
Slight	Moderate: fair stability; some excavation needed for parking lots.	Slight	Slight.
Slight	Moderate: fair stability; some excavation needed for parking lots.	Slight	Moderate: slope; very slowly permeable fragipan at a depth of about 2½ feet.
Subject to flooding; seasonal high water table; floodwater damages landscape plantings in places	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding	Severe: subject to flooding.
Slight	Slight for roads; moderate for parking lots; slope.	Moderate: silty clay loam moderately affects workability.	Moderate: slope.
Severe: subject to flooding; seasonal high water table; floodwater damages landscape plantings in places.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding	Severe: subject to flooding.
Moderate: seasonal high water table: some shrubs not adapted; lawns damaged if used during wet periods.	Moderate: seasonal high water table.	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet.	Moderate: somewhat poorly drained; seasonal high water table above a very slowly permeable fragipan.
Severe: steep slopes severely hinder development of site; severe erosion hazard.	Severe: steep slopes severely hinder development of site.	Severe: 30- to 60-inch depth to sandstone and shale bedrock.	Severe: steep slopes severely hinder development of site.
Slight	Slight	Severe: depth to rapidly permeable material less than 5 feet; leachate flow to ground water.	Severe: depth to rapidly permeable material less than 5 feet; severe hazard of effluent seepage.
Slight	Slight for roads; moderate for parking lots; slope.	Severe: depth to rapidly permeable material less than 5 feet; hazard of leachate flow to ground water.	Severe: depth to rapidly permeable material less than 5 feet; severe hazard of effluent seepage.
Moderate: subject to flooding; floodwater damages landscape plantings in places.	Moderate: subject to flooding	Severe: subject to flooding	Severe: subject to flooding.
Moderate: subject to flooding; floodwater damages landscape plantings in places.	Moderate: subject to flooding	Severe: subject to flooding	Severe: subject to flooding.
Slight	Moderate for roads; severe for parking lots; slope.	Severe: 48- to 80-inch depth to bedrock.	Severe: Slope.

TABLE 9.—*Degree and kind of limitations of the*

Soil series and map symbols	Estimated degree of limitations for—	
	Residential or light industrial development[1]	Septic tank absorption fields
Zainesville (con.):		
ZaC3	Moderate: moderately sloping; some excavation generally required.	Severe: very slow permeability; depth to fragipan ranges from 25 to 36 inches.
ZaD2, ZaD3	Severe: slope	Severe: slope severely hinders design of septic system
Zipp: Zp	Severe: subject to ponding and flooding; very poorly drained; seasonal high water table.	Severe: very poorly drained; subject to ponding and seasonal high water table; very slow permeability, estimated percolation rate slower than 75 minutes per inch.

[1] Disposal of septic-tank effluent not considered.

The climate is so nearly uniform throughout the county that differences among the soils cannot be explained on the basis of differences in climate alone. Climatic forces act upon rocks to form the parent materials from which soils are formed, but many of the more important soil characteristics would not develop except for the activity of plant and animal life. Without the changes brought about by the presence of plants and animals, the soils would consist merely of residual or transported materials derived from weathered rock, although some might have definite layers that formed by additions of alluvium or colluvium because of differential weathering or leaching.

Climate, acting alone on the parent material, would be largely destructive. It would cause the soluble materials to be washed out of the soils. Combined with the activities of plants and animals, the processes of climate become constructive. A cycle is established in which leaching moves plant nutrients downward in the soil, and the nutrients are then carried upward when they are used by plants. When the plants die, the surface soil is renewed by the plant nutrients that are returned to the upper part of the soil. In this county the climate is such that leaching of nutrients is greater than replacement. For this reason, most of the soils are strongly weathered, leached, acid, and low in fertility.

Plant and animal life

Plants, micro-organisms, earthworms, and other forms of life that live on and in the soil contribute to its morphology. Bacteria and fungi are micro-organisms that affect the soils. They cause raw plant waste to decompose into organic matter and to be incorporated into the soil. The higher forms of plants return organic matter to the soil and bring nutrients from the lower part of the soil.

Before this county was settled, the native vegetation was most important in the complex of living organisms that affect soil development.

The native vegetation in this county was mostly hardwood trees. The common species were tulip-poplar, oak, hickory, elm, maple, and ash. Compared with soils that formed under grass, a relatively small amount of organic matter became incorporated in these soils while they were forming. In wooded areas on uplands, thin layers of forest litter and leaf mold cover the soil. A small amount of organic matter from decayed leaves and twigs is mixed throughout the upper 1 or 2 inches of the surface layer. Examples of soils that formed mainly under hardwood trees are Hosmer and Reesville. In some parts of the county, in areas occupied by Patton and Ragsdale soils, the native vegetation included swamp grasses and sedges as well as water-tolerant trees. These soils were covered by water much of the time, and as the organic material fell into the water, it decayed slowly and some of it accumulated.

The vegetation is fairly uniform throughout the county. Major differences in most soils, therefore, cannot be explained on the basis of differences in vegetation, although some comparatively minor variations in the vegetation are associated with different soils. These variations are probably chiefly the results of other soil-forming factors, such as parent material or relief.

Relief

The relief of Vanderburgh County ranges from nearly level on bottom lands, terraces, and upland flats to very steep on breaks along streams. Most of the landscape in the county has been dissected by weathering and by streams. The county lies entirely within the physiographic subdivision known as the Wabash lowland (*5*). The area is characterized by extensive areas of alluvium and deposits of lacustrine material. The main features of the Wabash lowland are the filled-in valleys and the bedrock hills, resembling monadnocks, that stand like islands in the midst of alluvium (*6*). The lowest point in Vanderburgh County is 357 feet above sea level, where Bayou Creek joins the Ohio River. The highest point is 600 feet above sea level and is about 1½ miles northeast of St. Joseph in the west-central part of the county.

The variations in relief have affected drainage and formation of the soils in the county. The influence of relief upon soil formation results from its controlling effect upon drainage, runoff, depth to the water table, and other water effects, including normal and accelerated erosion.

Differences in relief have radically affected moisture and air conditions of the soil. Profiles of soils that formed in the

soils from town and country planning—Continued

Estimated degree of limitations for—Continued			
Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Waste-stabilization lagoons
Moderate: severely eroded	Moderate for roads; severe for parking lots; slope.	Severe: 48- to 80-inch depth to bedrock	Severe: slope.
Severe: strongly sloping	Severe: slope	Severe: 48- to 80-inch depth to bedrock.	Severe: slope.
Severe: subject to ponding and flooding; very poorly drained; seasonal high water table.	Severe: subject to ponding and flooding; very poorly drained; seasonal high water table; high shrink-swell potential.	Severe: subject to ponding; very poorly drained; seasonal high water table; silty clay and clay severely affect workability.	Severe: subject to ponding; seasonal high water table; very poorly drained.

same type of parent material in steep areas are less strongly developed than those that formed in nearly level to sloping areas. Weaker profile development in steep areas is caused by more rapid erosion, reduced percolation of water through the soil material, and lack of water in the soil for the vigorous growth of plants that influence soil formation. The degree of profile development within a given time, on a given parent material and under the same type of vegetation, depends largely on the amount of water that passes through the soil material.

Because of the variations in relief in this county, several different soils have formed from the same kind of parent material. A good example of the way relief has affected the soils that formed in the same kind of parent material is the Alford catena of soils that formed in deep loess. The Iva soils are nearly level and are somewhat poorly drained. They are gray and mottled and are slowly permeable. The Alford soils are gently sloping to strongly sloping and are well drained, brown, and moderately permeable.

Time

In general, the longer the parent material has remained in place, the more fully developed is the soil profile. Because of differences in parent material, relief, and climate, some soils mature more slowly than others. For example, such soils as Wilbur and Wakeland that formed in alluvium are immature, because the parent materials are young and new materials are deposited periodically. Steep soils generally are immature, because geological erosion removes the soil material as it accumulates. Also, runoff is more severe on steep soils and less water percolates down through the soil material. A mature soil is one that has well-developed surface and subsoil horizons that were produced by the natural processes of soil formation. A young soil has little or no horizon differentiation.

Soils such as Alford and Hosmer that formed in loess are about 20,000 years old. They have well-developed profiles and are considered to be mature or nearly so.

Such young soils as Huntington, Lindside, and Newark are on bottom lands where new materials are deposited periodically.

Classification of the Soils

Classification consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge within farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories, so that information can be applied to large geographic areas.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and revised later (*9*). The system currently used by the National Cooperative Soil Survey was developed in the early sixties (*8*) and was adopted in 1965 (*12*). It is under continual study.

The current system of classification has six categories. Beginning with the most inclusive, these categories are: order, suborder, great group, subgroup, family, and series. The criteria for classification are soil properties that are observable or measurable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 10 shows the classification of each soil series of Vanderburgh County by family, subgroup, and order, according to the current system.

ORDER. Ten soil orders are recognized. The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. Three exceptions to this are the Entisols, Histosols, and Vertisols, which occur in many different climates.

SUBORDER. Each order is subdivided into suborders using those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders are more narrowly defined than are the orders. The soil properties used to separate suborders are mainly those that reflect

TABLE 10.—*Soil series classified according to the current system of classification*

Series	Family	Subgroup	Order
Alford	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Bartle	Fine-silty, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Birds	Fine-silty, mixed, nonacid, mesic	Typic Fluvaquents	Entisols.
Bonnie	Fine-silty, mixed, acid, mesic	Typic Fluvaquents	Entisols.
Borrow pits	Loamy, mixed, mesic	Udorthents	Entisols.
Evansville	Fine-silty, mixed, nonacid, mesic	Typic Haplaquepts	Inceptisols.
Ginat	Fine-silty, mixed, mesic	Typic Fragiaqualfs	Alfisols.
Gullied land	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Henshaw	Fine-silty, mixed, mesic	Aquic Hapludalfs	Alfisols.
Hosmer	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols.
Huntington	Fine-silty, mixed, mesic	Fluventic Hapludolls	Mollisols.
Huntington, sandy variant	Coarse-loamy, mixed, mesic	Fluventic Hapludolls	Mollisols.
Iona	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Iva	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Lindside	Fine-silty, mixed, mesic	Fluvaquentic Eutrochrepts	Inceptisols.
Markland	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
McGary	Fine, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Muren	Fine-silty, mixed, mesic	Aquic Hapludalfs	Alfisols.
Newark	Fine-silty, mixed, nonacid, mesic	Aeric Fluvaquents	Entisols.
Patton	Fine-silty, mixed, mesic	Typic Haplaquolls	Mollisols.
Princeton	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Ragsdale	Fine-silty, mixed, mesic	Typic Argiaquolls	Mollisols.
Rahm	Fine-silty, mixed, nonacid, mesic	Aeric Fluvaquents	Entisols.
Reesville	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Sciotoville[1]	Fine-loamy, mixed, mesic	Aquic Fragiudalfs	Alfisols.
Stendal	Fine-silty, mixed, acid, mesic	Aeric Fluvaquents	Entisols.
Uniontown	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Wakeland	Coarse-silty, mixed, nonacid, mesic	Aeric Fluvaquents	Entisols.
Weinbach	Fine-silty, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Wellston	Fine-silty, mixed, mesic	Ultic Hapludalfs	Alfisols.
Wheeling	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Wilbur	Coarse-silty, mixed, nonacid, mesic	Aquic Udifluvents	Entisols.
Woodmere	Fine, mixed, mesic	Dystric Fluventic Eutrochrepts	Inceptisols.
Zanesville	Fine-silty, mixed, mesic	Typic Fragiudults	Ultisols.
Zipp	Fine, mixed, nonacid, mesic	Typic Haplaquepts	Inceptisols.

[1]This soil is a taxadjunct. In Vanderburgh County Sciotoville soils have fine-silty control sections and are therefore outside the defined range for the Sciotoville series. This difference does not alter their usefulness and behavior.

either the presence or absence of a water table at a shallow depth; soil climate; the accumulation of clay, iron, or organic carbon in the upper part of the solum; cracking of soils caused by a decrease in soil moisture; and fine stratification.

GREAT GROUP. Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of soil horizons and features. The horizons used to make separations are those in which clay, carbonates, and other constituents have accumulated or have been removed and those that have fragipans that interfere with the growth of roots, movement of water, or both. Some features used are soil acidity, soil climate, soil composition, and soil color.

SUBGROUP. Each great group is subdivided into subgroups. One subgroup represents the central (typic) segment of the group. Others, called intergrades, are made up of soils that have mostly the properties of one great group but also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside the range of any other great group, suborder, or order.

FAMILY. Soil families are separated within a subgroup mainly on the basis of properties important to the growth of plants or to the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, soil depth, and consistence.

SERIES. The series is a group of soils that formed from a particular kind of material and have major horizons that, except for texture of the surface layer, are similar in important characteristics and in arrangement in the profile. The soils are given a name of a geographic location near the place where that series was first observed and mapped.

Laboratory Data[4]

[4]By DR. DONALD P. FRANZMEIER, associate professor of agronomy, Purdue University.

Laboratory data for some soils are included here to help explain some aspects of soil genesis—how the parent material was deposited and how soil horizons formed. Data are reported for the Evansville and Huntington soils. The analysis for Evansville silt loam is from the profile described in the section "Descriptions of the Soils." Descriptions of the two profiles of Huntington silty clay loam, which are similar to that described as representative for the Huntington series, are available upon request from the Purdue University Plant and Soils Analysis Laboratory. Particle-size analysis and organic-carbon content were determined by soil scientists in the Purdue University laboratory; and reaction (pH), extractable phosphorus, and extractable potassium, were determined by the Purdue University Plant and Soil Analysis Laboratory.

In table 11, data on oxidizable organic carbon were determined by the Walkley-Black method, which involved oxidation of organic carbon by potassium dichromate and sulfuric acid. In the particle-size analysis, organic matter was destroyed if the organic carbon content was greater than 2 percent. Clay content was determined after dispersion by a Calgon solution and overnight shaking. Following the clay determination the suspension was passed through a 50-micron sieve and the same fraction was collected, dried, and weighed. Silt content was determined by difference. Reaction (pH) was determined using a glass electrode pH meter on a 1 to 1 soil-water suspension. Extractable phosphorus was determined by the Bray P-1 test. The soil was extracted with a 0.025N HCl and 0.03N NH_4F solution, and phosphorus was determined by the molybdophosphoric blue colorimetric method. Extractable potassium was extracted with neutral IN ammonium acetate and determined using an atomic adsorption spectrophotometer. The phosphorus and potassium determinations were the routine tests for available nutrients and are reported as pounds per acre. The assumption was made that the plow layer of an acre of soil weighs 2,000,000 pounds.

Results obtained show that the poorly drained Evansville soils are high in silt (67 to 75 percent), moderate in clay (22 to 30 percent), and low in sand (0.5 to 9 percent)—a particle-size distribution that is typical of silty lakebed soils. There is little evidence of clay movement from the A horizon to the B horizon. The two lowest horizons show evidence of stratification. The high pH values indicate that little soil leaching has occurred.

The well-drained Huntington soils are high in silt (64 to 75 percent), moderate in clay (28 to 37 percent), and low in sand (3 to 10 percent in the upper 25 to 30 inches). The lower horizons contain more sand and show greater evidence of stratification. The high pH values and the relatively uniform levels of extractable potassium and phosphorus indicate that very little or no leaching has occurred. The moderate to high phosphorus levels indicate that the Huntington soils formed in alluvium that is high in phosphate.

General Nature of the County

This section presents general facts about Vanderburgh County. Briefly discussed are farming, organization, population, climate, industry, transportation, and markets.

Farming

In 1969, 59.9 percent of the land area in Vanderburgh County, or 92,454 acres, was in farms. The farms numbered 544 and averaged 169.9 acres in size. Of these, 280 were run by full owners, 194 by part owners, and 70 by tenants. About 65,204 acres were harvested cropland in 1969, 5,182 acres were cropland used for grazing, 8,011 acres were other types of crops, and 6,439 acres were woodland, including woodland pasture.

Because of the nature and condition of the land area, general farming is prevalent. Grain farming is the practice on river bottoms, terraces, and nearly level uplands. In some of the river bottom and terrace areas, large acreages of white corn are grown for special commercial use. Corn and soybeans are the main crops. Hay crops provide pasture for livestock. Most pastures consist of ladino, red clover, lespedeza, and grass mixtures. In recent years straight fescue pastures have been highly successful. Truck crops and orchard crops are grown mainly for family use.

Organization and Popuation

Vanderburgh County was organized January 7, 1818, by an act passed by the General Assembly of Indiana (*4*). It was named in honor of Judge Henry Vanderburgh.

The historical beginnings of Vanderburgh County center around the organization and growth of Evansville, the county seat. About 1800 a settlement known as Saundersville was started. This settlement was composed of English, Irish, and Scotch immigrants. In the western part of what is now Evansville, a settlement known as Lamasco was built up by German immigrants. Lamasco and Saundersville subsequently merged to become the town of Evansville.

On June 14, 1814, Evansville became the authorized seat of justice for Warrick County, the county it was in at that time. The town was named in honor of General Robert M. Evans, a distinguished soldier and citizen of Gibson County.

After the Germanic revolution of 1848, many Germans came to the section in and around Vanderburgh County. The French and English came after the Napoleonic Wars, the Irish came after the Irish rebellion, and some southerners migrated to the North after the Civil War.

The Angel Mounds in the southeastern part of the county are of historical interest, because they probably represent the first human settlement of Vanderburgh County—the beginnings of primitive culture. Archeological excavations of the old Indian village site and the mounds were begun in 1939. The mounds were generally used for burial places, although some undoubtedly were built for ceremonial purposes and as fortifications.

All the industries in the county are in Evansville, which has more than 185 leading modern industries that manufacture more than 200 different products. Evansville is one of the most important manufacturing cities in the State of Indiana.

In 1940 the population of the county was 130,783, of which 97,062 lived in urban areas and 33,721 lived in rural areas. In 1970 the population of the county was 168,772, of which 142,476 lived in urban areas and 26,296 lived in rural areas. Thus, along with the increase in overall population during the 30-year period, a sizeable increase in urban population and a substantial decrease in rural population have occurred.

Climate[5]

[5]By LAWRENCE A. SCHAAL, climatologist for Indiana, National Weather Service, U.S. Department of Commerce.

Vanderburgh County has an invigorating climate because both polar and tropical airflow pervade the area. Pleasant, cloudless days are interspersed with some rainy days throughout the year. Rainfall, generally adequate in all seasons, favors diversified farming. In some summers when moisture utilization is high, however, a month of below-average rainfall adversely affects lawns, pastures, and crops.

Changes in weather occur every few days as a result of the passing of weather fronts and the presence of associated centers of low and high pressure. In general high pressure is followed by lower temperatures, lower humidity, and sunny days and low pressure by increasing temperatures, increasing southerly winds, higher humidity, and rain or showers. Weather is the least active late in summer and the most active and accompanied by greater temperature changes in winter.

TABLE 11.—*Physical and chemical*

[These tests were performed in the laboratories of Purdue University. Absence of data on size, class,

Soil name	Horizon	Depth from surface	Texture	Size, class, and diameter of particles— Coarse sand (1.0-0.5 mm)	Medium sand (0.5-0.25 mm)
		In		*Pct*	*Pct*
Evansville silt loam	Ap	0-9	Heavy silt loam		
	B1g	9-21	Silty clay loam		
	B2g	21-32	Silty clay loam		
	B3g	32-44	Silty clay loam		
	C1g	44-66	Silty clay loam		
	C2g	66-74	Heavy silt loam		
Huntington silty clay loam	Ap	0-11	Light silty clay loam		
	B21	11-30	Light silty clay loam	0.1	0.1
	B22	30-52	Light silty clay loam		0.1
	C	52-91	Heavy silt loam		
Huntington silty clay loam	Ap	0-10	Light silty clay loam		
	B21	10-22	Silty clay loam		
	B22	22-40	Silty clay loam		
	C	40-80	Light silty clay loam		

Precipitation is rather evenly distributed throughout the year. Evaporation losses peak in July or August, however, so in these months the need for rain is more critical. Weekly rainfall statistics indicate that the wettest week generally is early in April. The possibility of 1 inch or more of rain is 43 percent in April and 20 percent late in October and early in November.

According to a study of the area, the probability of unusually heavy rains is as follows:

Frequency in 100 years	Rain in 1 hour Inches	6 hours Inches	12 hours Inches
4	2.3	3.7	4.4
10	2.0	3.1	3.8
20	1.8	2.8	3.4

Snowfall varies greatly from winter to winter. The average annual snowfall is 13 inches, but season totals have ranged from a few inches to as much as 49 inches (1912 and 1917). An occasional snow or ice storm hampers activity, but it also protects winter wheat from the severe cold which generally follows.

Relative humidity varies on sunny days, ranging from about 40 percent in the afternoon to almost 100 percent at the time of minimum temperature. Average relative humidity at noon is 56 percent in the summer and 65 percent in the winter. The 6 a.m. average is 77 percent in the winter and 85 percent in the summer.

Most sunny days occur in August when an average of 8 days are cloudy. In January an average of 19 days are cloudy. The percent of maximum possible sunshine averages 42 percent in December and January but increases to 77 percent in August.

Prevailing winds are from the southwest, but in one or two of the winter months prevailing winds are northwesterly. The average annual wind velocity is 8 miles per hour. Much of the wind movement near the ground occurs during the day. Evening and early morning generally are the best times for farm-spraying operations. Damaging winds occur during thunderstorms a few times a year. Thunderstorms, including incidences of lightning and thunder, are observed on an average of about 47 days a year. Tornadoes strike the county every few years, and some of them are destructive.

Data on temperature and precipitation are given in table 12. The probabilities of the last freezing temperatures in spring and the first in the fall are given in table 13.

Additional climatic information is available in the "Local Climatological Data—Evansville, Indiana," a publication of the National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

Industries, Transportation, and Markets

In addition to farming, important industries are in the county. Evansville, the county seat, is a highly industrialized city that has major manufacturing complexes providing employment for a large number of workers from Vanderburgh County and the surrounding areas.

Four railroads serve Vanderburgh County—the Southern, Penn Central, Illinois Central, and Louisville and Nashville. U.S. Highways 41 and 460, Interstate Highway 64, and four State roads pass through the county. The Ohio River is a good transportation medium for many raw materials from New Orleans, St. Louis, Louisville, Cincinnati, and other eastern cities. Airlines and buslines also operate on regular schedules.

Evansville, Louisville, and Indianapolis are the major livestock markets and are within reasonable distances.

Grain elevators, barge, truck, and rail transportation provide adequate handling of grain at harvest time.

analyses of selected soils

and diameter of particles indicates that a quantity of less then the minimum reportable was detected]

Size, class, and diameter of particles—continued: Fine sand (0.15-0.1 mm)	Very fine sand (0.1-0.05 mm)	Silt (0.05-0.002 mm)	Clay (less than 0.002 mm)	Organic carbon	Reaction (1.1 suspension)	Extractable phosphorus	Extractable potassium
Pct	*Pct*	*Pct*	*Pct*	*Pct*	*pH*	*Lb/acre*	*Lb/acre*
--------	0.5	75.7	23.8	1.18	6.2	11	195
--------	2.7	69.2	28.1	--------	6.6	2	165
--------	3.8	66.6	29.6	--------	7.0	2	150
--------	1.6	70.1	28.3	--------	7.3	1	180
--------	2.6	69.6	27.8	--------	7.5	5	180
--------	9.0	69.1	21.6	--------	7.9	1	120
0.2	0.03	71.2	28.3	1.70	7.5	53	210
0.4	2.1	64.3	33.0	--------	7.0	26	105
1.0	16.8	58.6	23.5	--------	6.8	23	90
8.6	35.2	39.8	16.4	--------	6.8	40	90
--------	8.1	67.8	24.1	1.31	7.6	28	165
--------	2.6	63.8	33.6	--------	7.3	18	135
--------	2.8	62.3	34.9	--------	7.1	43	135
--------	6.2	60.7	30.8	--------	7.0	49	120

TABLE 12.—*Temperature and precipitation*

[All data from National Weather Service station at Dress Memorial Airport, Evansville]

Month	Temperature: Average daily maximum	Average daily minimum	Average monthly maximum	Average monthly minimum	Precipitation: Average monthly total	One year in 10 will have—: Less than	One year in 10 will have—: More than	Days with snow cover of 1 inch or more	Average depth of snow on days with snow cover of 1 inch or more
					Inches	*Inches*	*Inches*	*Number*	*Inches*
January	43	26	64	6	4.0	0.9	8.0	5.2	1.9
February	47	28	66	11	3.2	1.0	6.6	2.9	2.6
March	55	35	76	19	4.3	1.5	9.2	1.7	2.4
April	69	47	83	32	4.0	1.3	6.4	.1	3.0
May	78	55	89	42	4.2	1.7	7.8	0	0
June	87	65	95	53	3.7	1.4	6.4	0	0
July	90	67	98	58	3.3	1.5	6.1	0	0
August	89	66	97	56	3.1	1.2	5.4	0	0
Septemter	83	57	94	45	2.9	.8	5.2	0	0
October	72	46	85	33	2.6	.4	5.6	0	0
November	55	34	75	21	3.2	1.0	5.7	.4	2.1
December	45	28	65	10	3.1	1.5	5.6	1.7	2.2
Year	68	46	[1]100	[2]2	41.6	30.9	53.5	12.0	2.4

[1]Average annual maximum.

[2]Average annual minimum.

TABLE 13.—*Probabilities of last freezing temperatures in spring and first in fall*

[All data from National Weather Service station at Dress Memorial Airport, Evansville]

Probability	Dates for given probability and temperature				
	16°F or lower	20°F or lower	24°F or lower	28°F or lower	32°F or lower
Spring:					
1 year in 10 later than	March 22	March 28	April 5	April 16	April 25
2 years in 10 later than	March 12	March 20	March 31	April 19	April 19
5 years in 10 later than	February 22	March 5	March 21	April 1	April 7
Fall:					
1 year in 10 earlier than	November 17	November 10	October 30	October 22	October 10
2 years in 10 earlier than	November 25	November 16	November 3	October 25	October 15
5 years in 10 earlier than	December 10	November 28	November 11	November 2	October 23

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Glossary

Acidity. See "Reaction, soil."

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity. The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeters in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizons above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Drainage, soil (internal). The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers, and by the height of the water table, either permanent or perched. Relative terms for expressing internal drainage are *none, very slow, slow, medium, rapid,* and *very rapid.*

Drift (geology). Material of any sort deposited by geologic processes in one place after having been removed from another; includes drift material deposited by glaciers and by streams and lakes associated with them.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Leaching. The removal of soluble materials from soils or other material by percolating water.

Loess. Fine-grained material, dominantly of silt-sized particles, that has been deposited by wind.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	PH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Slope, soil (percent). The number of feet of fall per 100 feet of horizontal distance expressed in percent.

0 to 2 percent	nearly level
2 to 6 percent	gently sloping
6 to 12 percent	moderately sloping
12 to 18 percent	strongly sloping
18 to 25 percent	moderately steep
25 to 35 percent	steep
35 or more percent	very steep

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Subsurface layer. A term used in nontechnical soil descriptions for the A2 horizon. (See "Horizon, soil.")

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

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GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Other information is given in tables as follows:

Acreage and extent, table 1, page 11.
Predicted yields, table 2, page 40.
Tree and shrub groups, table 3, page 50.
Wildlife, table 4, page 52.
Recreation, table 5, page 54.
Engineering, tables 6, 7, and 8, pages 58, 60, and 66.

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page	Tree and shrub group Number
AlB2	Alford silt loam, 2 to 6 percent slopes, eroded	11	IIe-3	41	III
AlC2	Alford silt loam, 6 to 12 percent slopes, eroded	11	IIIe-3	43	III
AlC3	Alford silt loam, 6 to 12 percent slopes, severely eroded	12	IVe-3	45	III
AlD3	Alford silt loam, 12 to 18 percent slopes, severely eroded	12	VIe-1	46	III
Ba	Bartle silt loam	15	IIw-3	42	II
Bd	Birds silt loam	16	IIIw-10	44	I
Bo	Bonnie silt loam	16	IIIw-10	44	I
Br	Borrow pits	16	VIIe-3	46	IV
Ev	Evansville silt loam	17	IIw-1	41	I
Gn	Ginat silt loam	17	IIIw-12	45	I
Gu	Gullied land	17	VIIe-4	47	IV
He	Henshaw silt loam	19	IIw-2	42	II
HoA	Hosmer silt loam, 0 to 2 percent slopes	20	IIw-5	43	II
HoB2	Hosmer silt loam, 2 to 6 percent slopes, eroded	20	IIe-7	41	II
HoB3	Hosmer silt loam, 2 to 6 percent slopes, severely eroded	20	IIIe-7	43	II
HoC2	Hosmer silt loam, 6 to 12 percent slopes, eroded	20	IIIe-7	43	II
HoC3	Hosmer silt loam, 6 to 12 percent slopes, severely eroded	21	IVe-7	45	II
HoD3	Hosmer silt loam, 12 to 18 percent slopes, severely eroded	21	VIe-1	46	II
Ht	Huntington silty clay loam	22	I-2	41	III
Hu	Huntington fine sandy loam, sandy variant	22	I-2	41	III
IoA	Iona silt loam, 0 to 2 percent slopes	23	I-1	41	III
IoB2	Iona silt loam, 2 to 6 percent slopes, eroded	23	IIe-3	41	III
Iv	Iva silt loam	23	IIw-2	42	II
Ln	Lindside silty clay loam	24	I-2	41	III
Ma	Made land	24	VIIe-3	46	IV
MkB2	Markland silt loam, 2 to 6 percent slopes, eroded	24	IIIe-11	43	II
MkC2	Markland silt loam, 6 to 18 percent slopes, eroded	24	IVe-11	45	II
MlC3	Markland silty clay loam, 6 to 18 percent slopes, severely eroded	25	VIe-1	46	II
Mr	McGary silt loam	26	IIIw-6	44	II
MuA	Muren silt loam, 0 to 2 percent slopes	27	I-1	41	III
MuB2	Muren silt loam, 2 to 6 percent slopes, eroded	27	IIe-3	41	III
Nw	Newark silty clay loam	28	IIw-7	43	I
Pa	Patton silty clay loam	28	IIw-1	41	I
PrB	Princeton fine sandy loam, 2 to 6 percent slopes	28	IIe-11	41	III
Ra	Ragsdale silt loam	29	IIw-1	41	I
Rh	Rahm silty clay loam	29	IIw-7	43	I
Rs	Reesville silt loam	30	IIw-2	42	II
ScA	Sciotoville silt loam, 0 to 2 percent slopes	30	IIw-5	43	II
ScB2	Sciotoville silt loam, 2 to 6 percent slopes, eroded	31	IIe-7	41	II
St	Stendal silt loam	31	IIw-7	43	I
UnB2	Uniontown silt loam, 2 to 6 percent slopes, eroded	32	IIe-3	41	III
Wa	Wakeland silt loam	32	IIw-7	43	I
Wb	Weinbach silt loam	33	IIw-3	42	II
WeD2	Wellston silt loam, 12 to 18 percent slopes, eroded	34	IVe-3	45	III
WeD3	Wellston silt loam, 12 to 18 percent slopes, severely eroded	34	VIe-1	46	III
WeE2	Wellston silt loam, 18 to 25 percent slopes, eroded	34	VIe-1	46	III

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Tree and shrub group
			Symbol	Page	Number
WeF	Wellston silt loam, 25 to 50 percent slopes	34	VIIe-1	46	III
WhA	Wheeling loam, 0 to 2 percent slopes	35	I-1	41	III
WhB2	Wheeling loam, 2 to 6 percent slopes, eroded	35	IIe-3	41	III
Wm	Wilbur silt loam	36	I-2	41	III
Wo	Woodmere silty clay loam	36	I-2	41	III
ZaC2	Zanesville silt loam, 6 to 12 percent slopes, eroded	37	IIIe-7	43	II
ZaC3	Zanesville silt loam, 6 to 12 percent slopes, severely eroded	37	IVe-7	45	II
ZaD2	Zanesville silt loam, 12 to 18 percent slopes, eroded	38	IVe-7	45	II
ZaD3	Zanesville silt loam, 12 to 18 percent slopes, severely eroded	38	VIe-1	46	II
Zp	Zipp silty clay	38	IIIw-2	44	I

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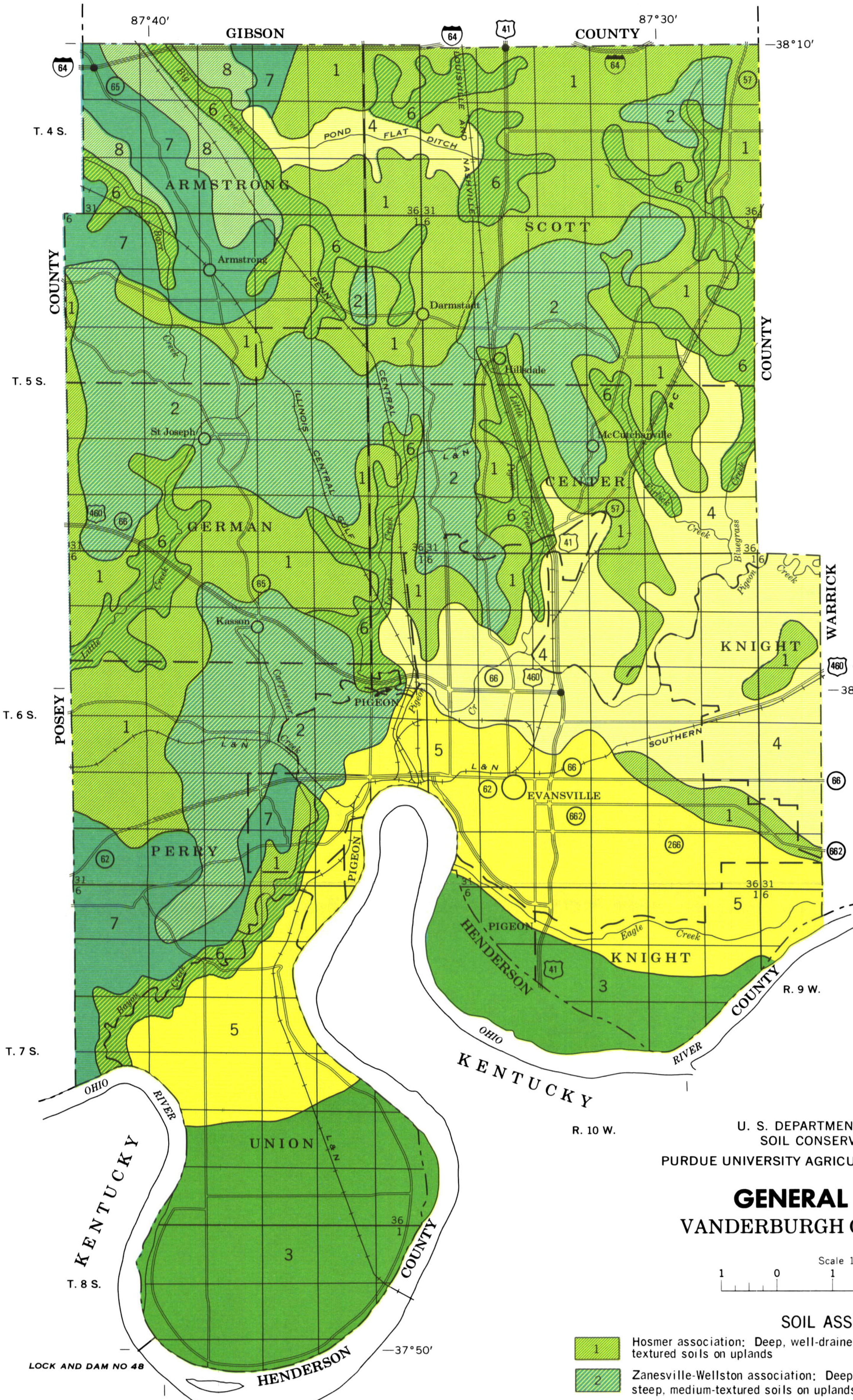
All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (http://directives.sc.egov.usda.gov/33086.wba).



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
VANDERBURGH COUNTY, INDIANA

Scale 1:126,720

1 0 1 2 3 4 Miles

SOIL ASSOCIATIONS *

1 Hosmer association: Deep, well-drained, nearly level to strongly sloping, medium-textured soils on uplands

2 Zanesville-Wellston association: Deep, well-drained moderately sloping to very steep, medium-textured soils on uplands

3 Huntington-Lindside association: Deep, well drained and moderately well drained, nearly level, moderately fine textured soils on bottom lands

4 Zipp-Patton-McGary association: Deep, very poorly drained to somewhat poorly drained, nearly level, fine-textured to medium-textured soils on terraces

5 Weinbach-Wheeling association: Deep, somewhat poorly drained and well drained, nearly level to gently sloping, medium-textured soils on terraces

6 Wakeland-Stendal-Birds association: Deep, somewhat poorly drained and poorly drained, nearly level, medium-textured soils on bottom lands

7 Alford-Muren association: Deep, well drained and moderately well drained, nearly level to strongly sloping, medium-textured soils on uplands

8 Reesville-Ragsdale association: Deep, somewhat poorly drained and very poorly drained, nearly level, medium-textured soils on uplands and in lakebeds

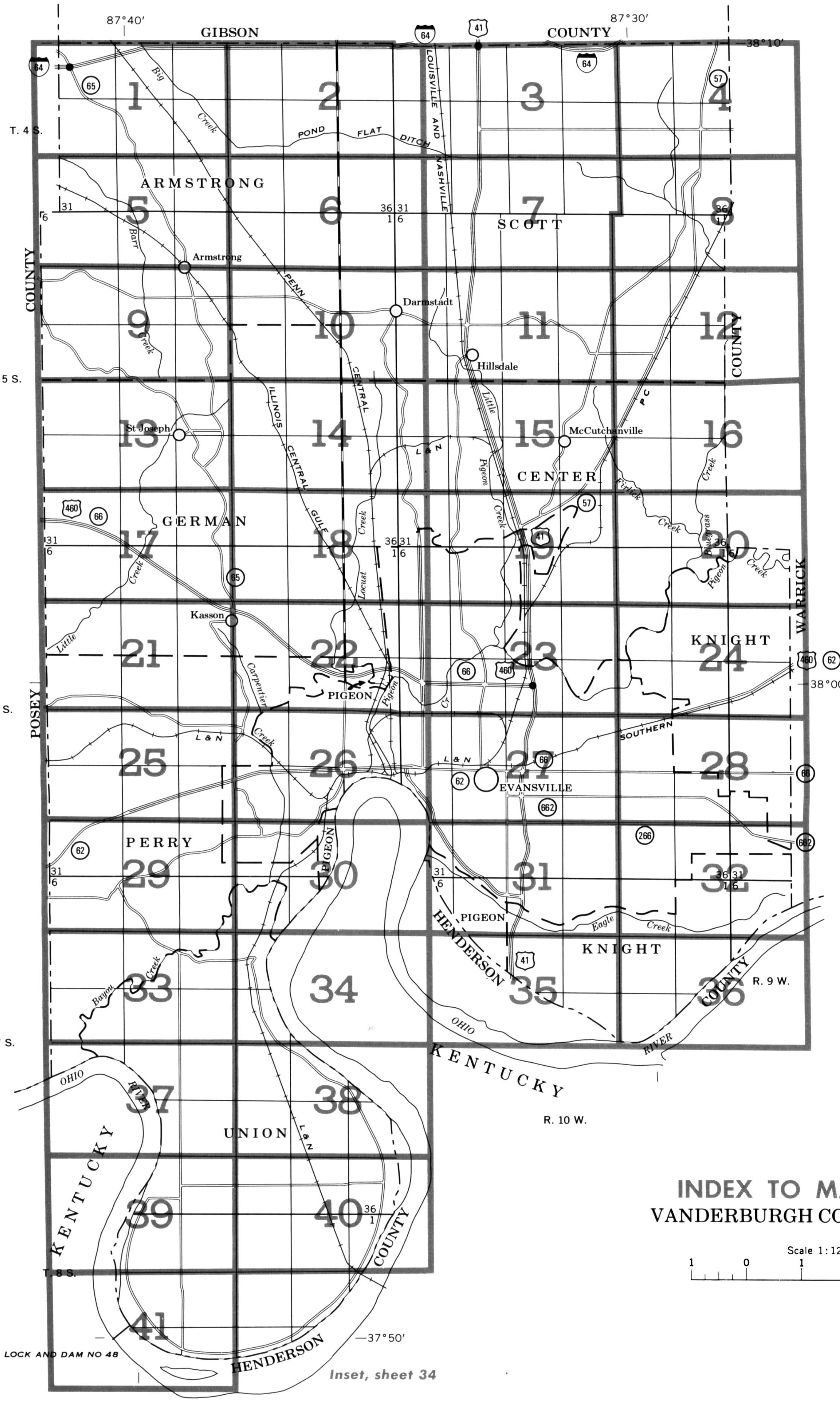
* Terms used for texture in the descriptive headings of the associations apply to the surface layer of the major soils.

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

Compiled 1974



INDEX TO MAP SHEETS
VANDERBURGH COUNTY, INDIANA

Scale 1:126,720

1 0 1 2 3 4 Miles

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

The first capital letter is the initial one of the soil name. The lowercase letter that follows separates mapping units having names that begin with the same letter except that it does not separate sloping or eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for soils with a slope range of 0 to 2 percent or they are for land types with a considerable range of slope. A final number, 2 or 3, in the symbol indicates that the soil is eroded or severely eroded.

SYMBOL	NAME
AIB2	Alford silt loam, 2 to 6 percent slopes, eroded
AIC2	Alford silt loam, 6 to 12 percent slopes, eroded
AIC3	Alford silt loam, 6 to 12 percent slopes, severely eroded
AID3	Alford silt loam, 12 to 18 percent slopes, severely eroded
Ba	Bartle silt loam
Bd	Birds silt loam
Bo	Bonnie silt loam
Br	Borrow pits
Ev	Evansville silt loam
Gn	Ginat silt loam
Gu	Gullied land
He	Henshaw silt loam
HoA	Hosmer silt loam, 0 to 2 percent slopes
HoB2	Hosmer silt loam, 2 to 6 percent slopes, eroded
HoB3	Hosmer silt loam, 2 to 6 percent slopes, severely eroded
HoC2	Hosmer silt loam, 6 to 12 percent slopes, eroded
HoC3	Hosmer silt loam, 6 to 12 percent slopes, severely eroded
HoD3	Hosmer silt loam, 12 to 18 percent slopes, severely eroded
Ht	Huntington silty clay loam
Hu	Huntington fine sandy loam, sandy variant
IoA	Iona silt loam, 0 to 2 percent slopes
IoB2	Iona silt loam, 2 to 6 percent slopes, eroded
Iv	Iva silt loam
Ln	Lindside silty clay loam
Ma	Made land
MkB2	Markland silt loam, 2 to 6 percent slopes, eroded
MkC2	Markland silt loam, 6 to 18 percent slopes, eroded
MIC3	Markland silty clay loam, 6 to 18 percent slopes, severely eroded
Mr	McGary silt loam
MuA	Muren silt loam, 0 to 2 percent slopes
MuB2	Muren silt loam, 2 to 6 percent slopes, eroded
Nw	Newark silty clay loam
Pa	Patton silty clay loam
PrB	Princeton fine sandy loam, 2 to 6 percent slopes
Ra	Ragsdale silt loam
Rh	Rahm silty clay loam
Rs	Reesville silt loam
ScA	Sciotoville silt loam, 0 to 2 percent slopes
ScB2	Sciotoville silt loam, 2 to 6 percent slopes, eroded
St	Stendal silt loam
UnB2	Uniontown silt loam, 2 to 6 percent slopes, eroded
Wa	Wakeland silt loam
Wb	Weinbach silt loam
WeD2	Wellston silt loam, 12 to 18 percent slopes, eroded
WeD3	Wellston silt loam, 12 to 18 percent slopes, severely eroded
WeE2	Wellston silt loam, 18 to 25 percent slopes, eroded
WeF	Wellston silt loam, 25 to 50 percent slopes
WhA	Wheeling loam, 0 to 2 percent slopes
WhB2	Wheeling loam, 2 to 6 percent slopes, eroded
Wm	Wilbur silt loam
Wo	Woodmere silty clay loam
ZaC2	Zanesville silt loam, 6 to 12 percent slopes, eroded
ZaC3	Zanesville silt loam, 6 to 12 percent slopes, severely eroded
ZaD2	Zanesville silt loam, 12 to 18 percent slopes, eroded
ZaD3	Zanesville silt loam, 12 to 18 percent slopes, severely eroded
Zp	Zipp silty clay

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Divided
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under

Buildings
- School
- Church

Mine and quarry (QU.)

Gravel pit

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Indian mound

Located object

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Limit of soil survey
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
- Unclassified

Canals and ditches

Lakes and ponds
- Perennial (water, w)
- Intermittent (int)

Spring

Marsh or swamp

Wet spot

Drainage end or alluvial fan

RELIEF

Escarpments
- Bedrock
- Other

Short steep slope

Prominent peak

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stoniness
  - Stony
  - Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully
- Saline spot

VANDERBURGH COUNTY, INDIANA NO. 1

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Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
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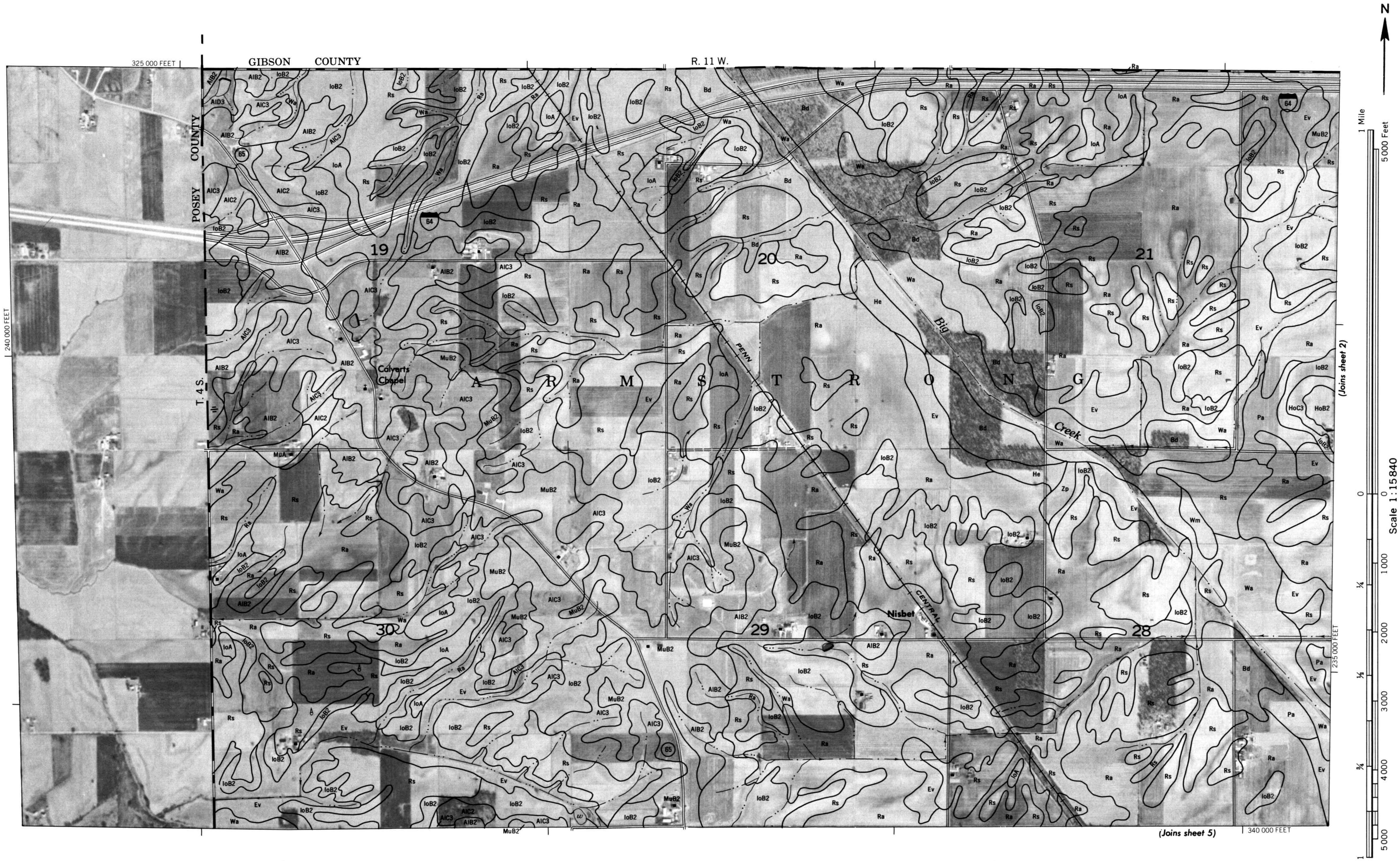

N

VANDERBURGH COUNTY, INDIANA — SHEET NUMBER 2

Scale 1:15840

1 Mile

5000 Feet

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

Land division corners are approximately positioned on this map.

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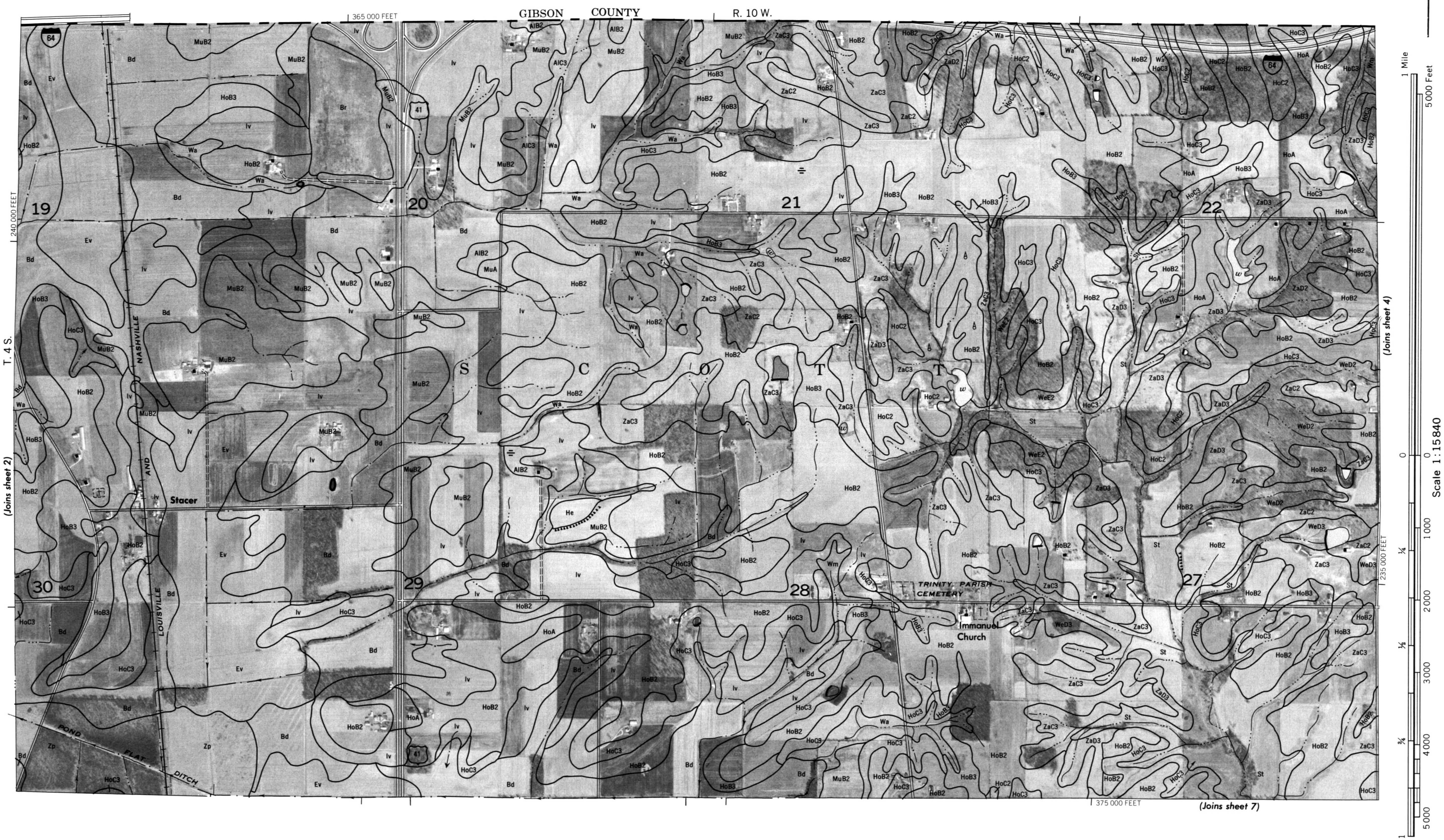
3



VANDERBURGH COUNTY, INDIANA NO. 3

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Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
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4

N

Scale 1:15840

1 Mile · 5 000 Feet

0 · 1000 · 2000 · 3000 · 4000 · 5000

Land division corners are approximately positioned on this map.

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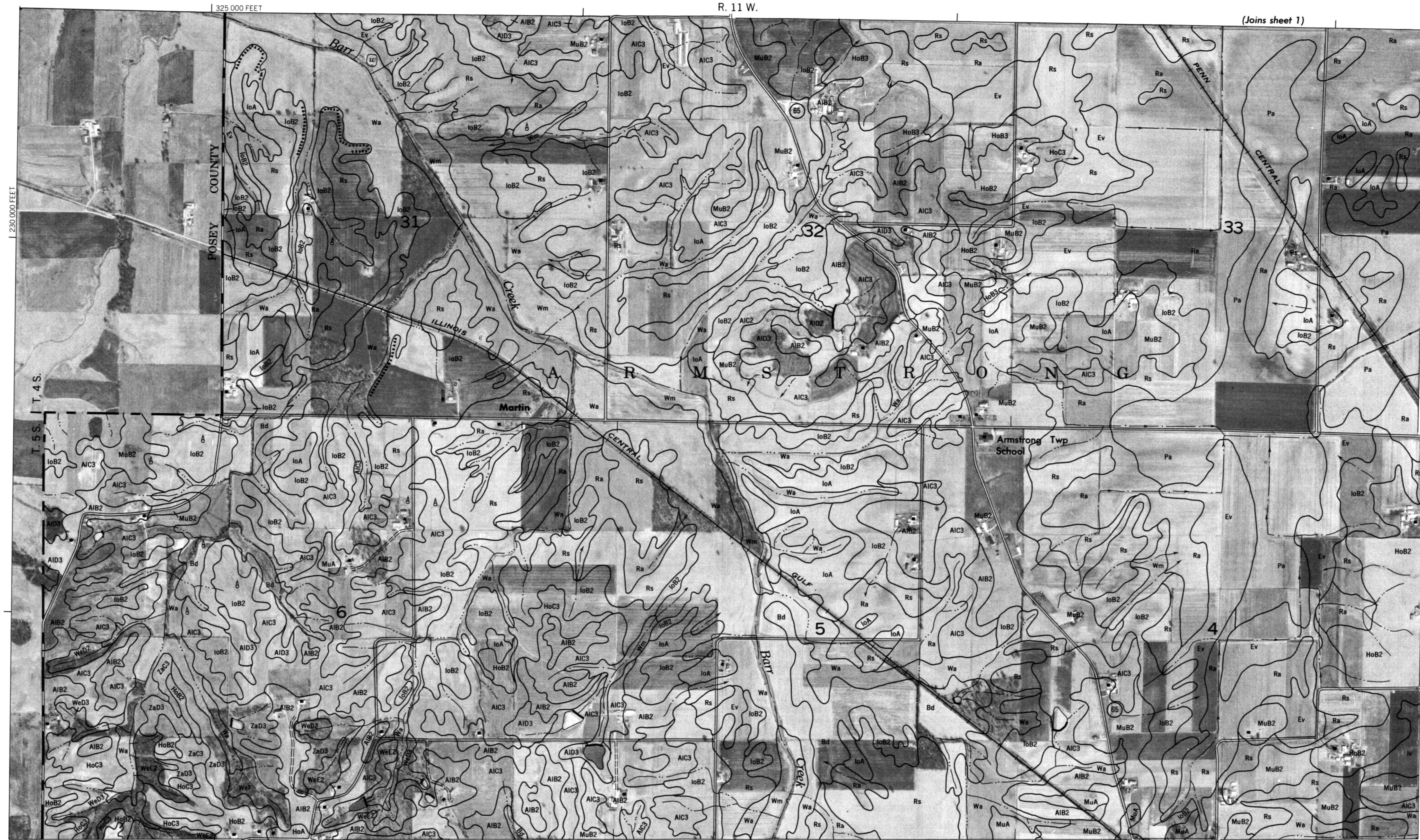
5

N



Scale 1:15840

1 Mile
5000 Feet
0 ¼ ½ ¾ 1
0 1000 2000 3000 4000 5000

VANDERBURGH COUNTY, INDIANA NO. 5

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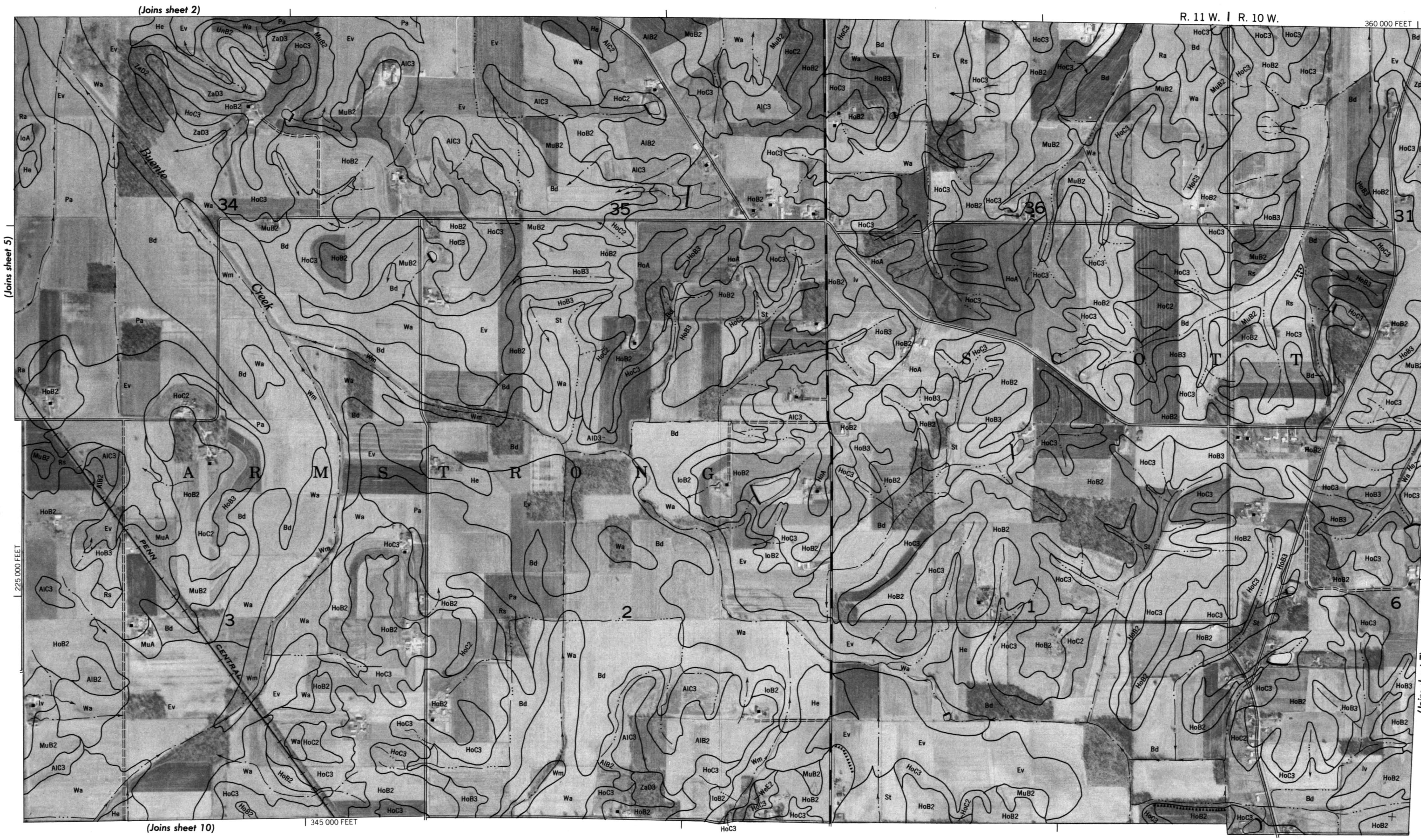
VANDERBURGH COUNTY, INDIANA — SHEET NUMBER 6

N

1 Mile
5000 Feet
Scale 1:15840
0
1000
2000
3000
4000
5000



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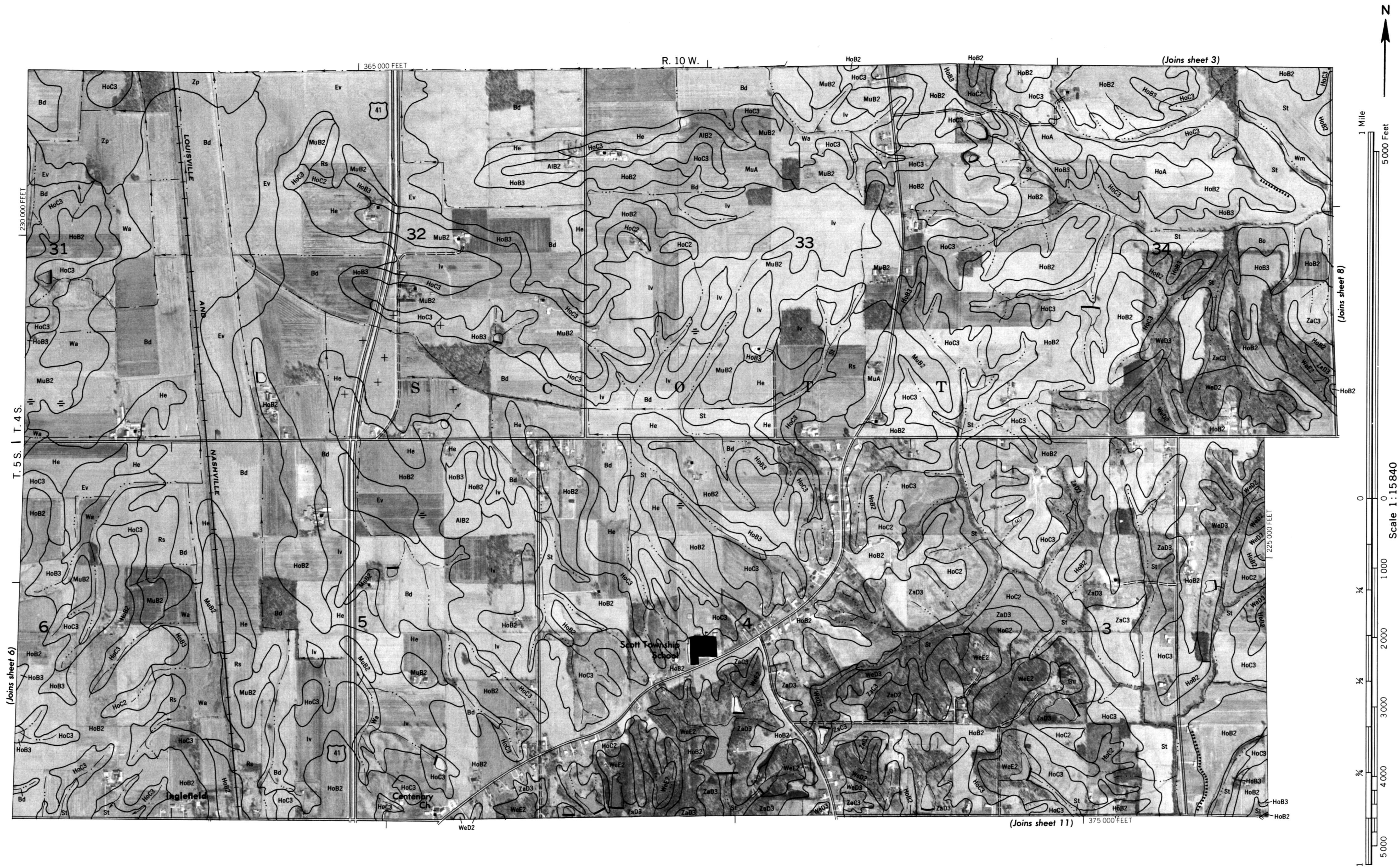

VANDERBURGH COUNTY, INDIANA NO. 7

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VANDERBURGH COUNTY, INDIANA — SHEET NUMBER 8

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VANDERBURGH COUNTY, INDIANA NO. 9

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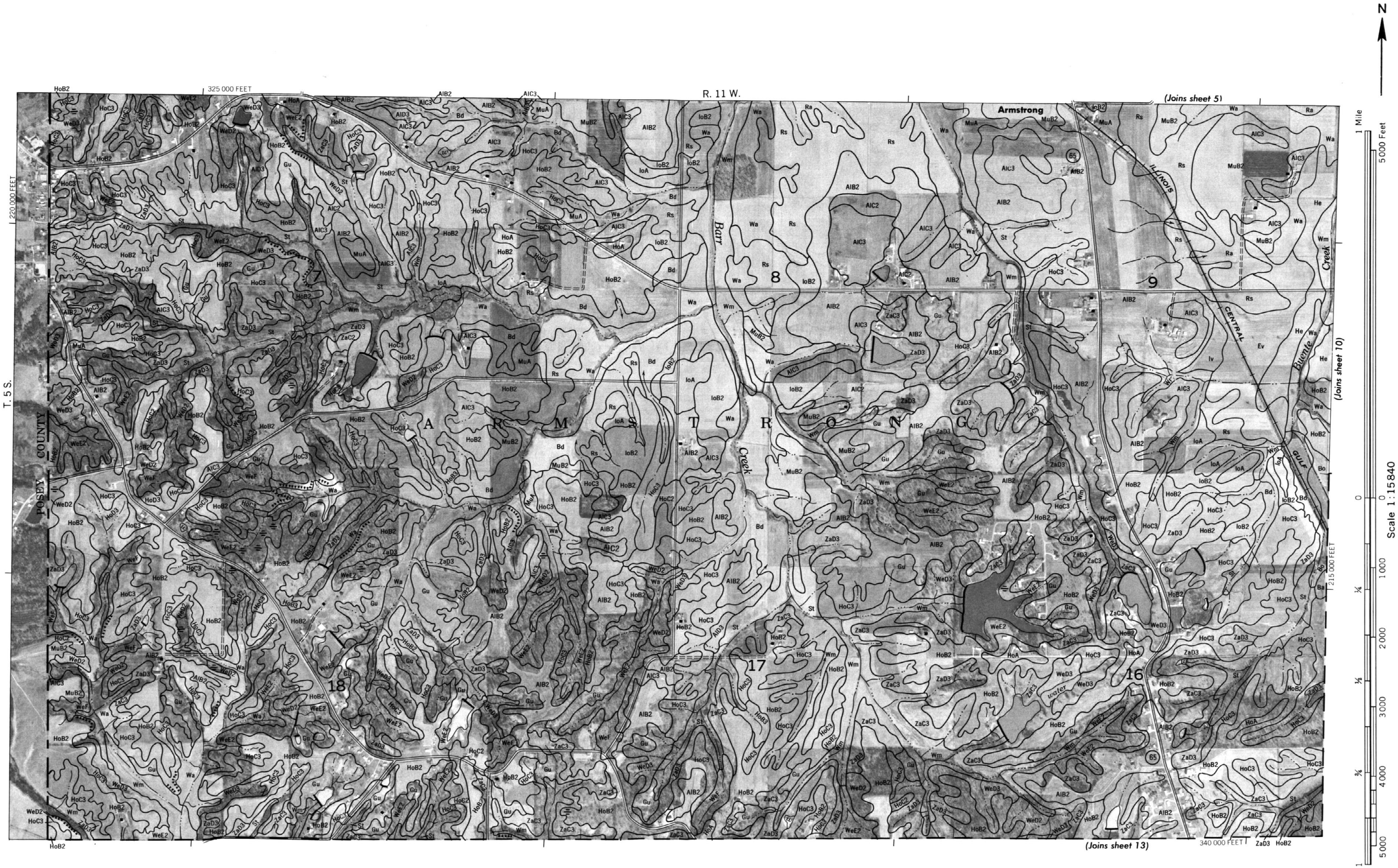
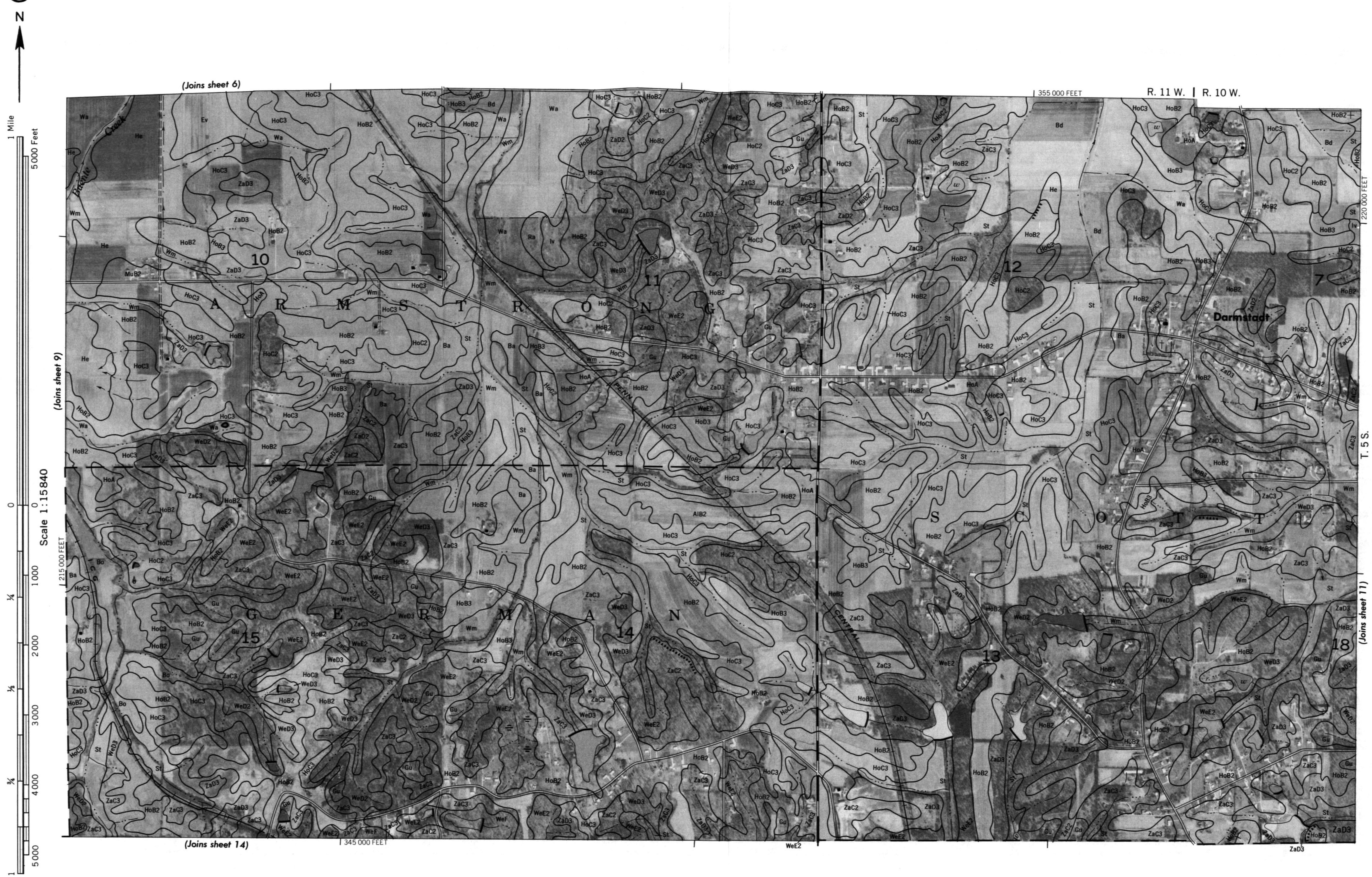


VANDERBURGH COUNTY, INDIANA — SHEET NUMBER 10



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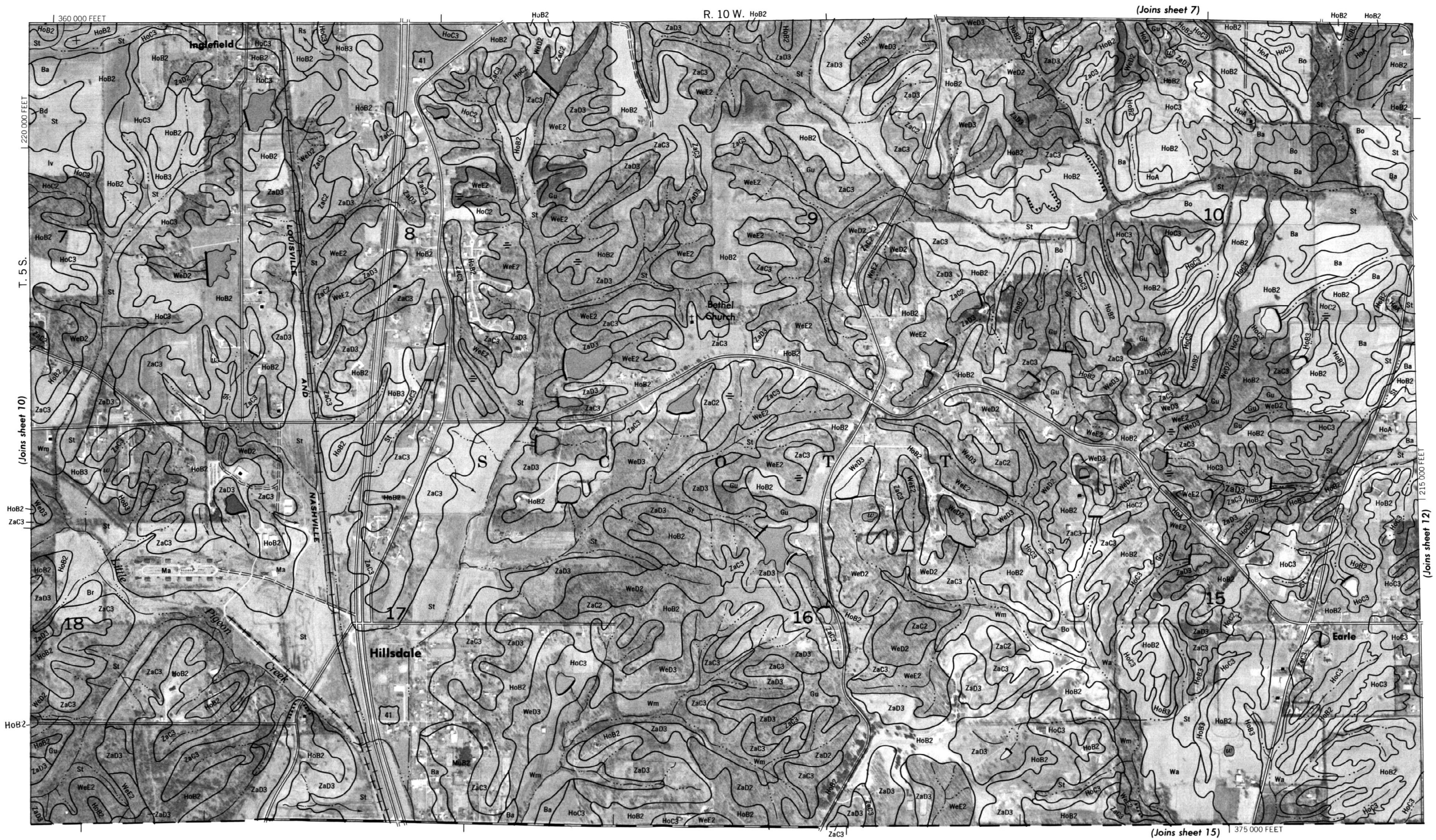
VANDERBURGH COUNTY, INDIANA NO. 10

11



N

Scale 1:15840

1 Mile

5000 Feet

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

VANDERBURGH COUNTY, INDIANA NO. 11

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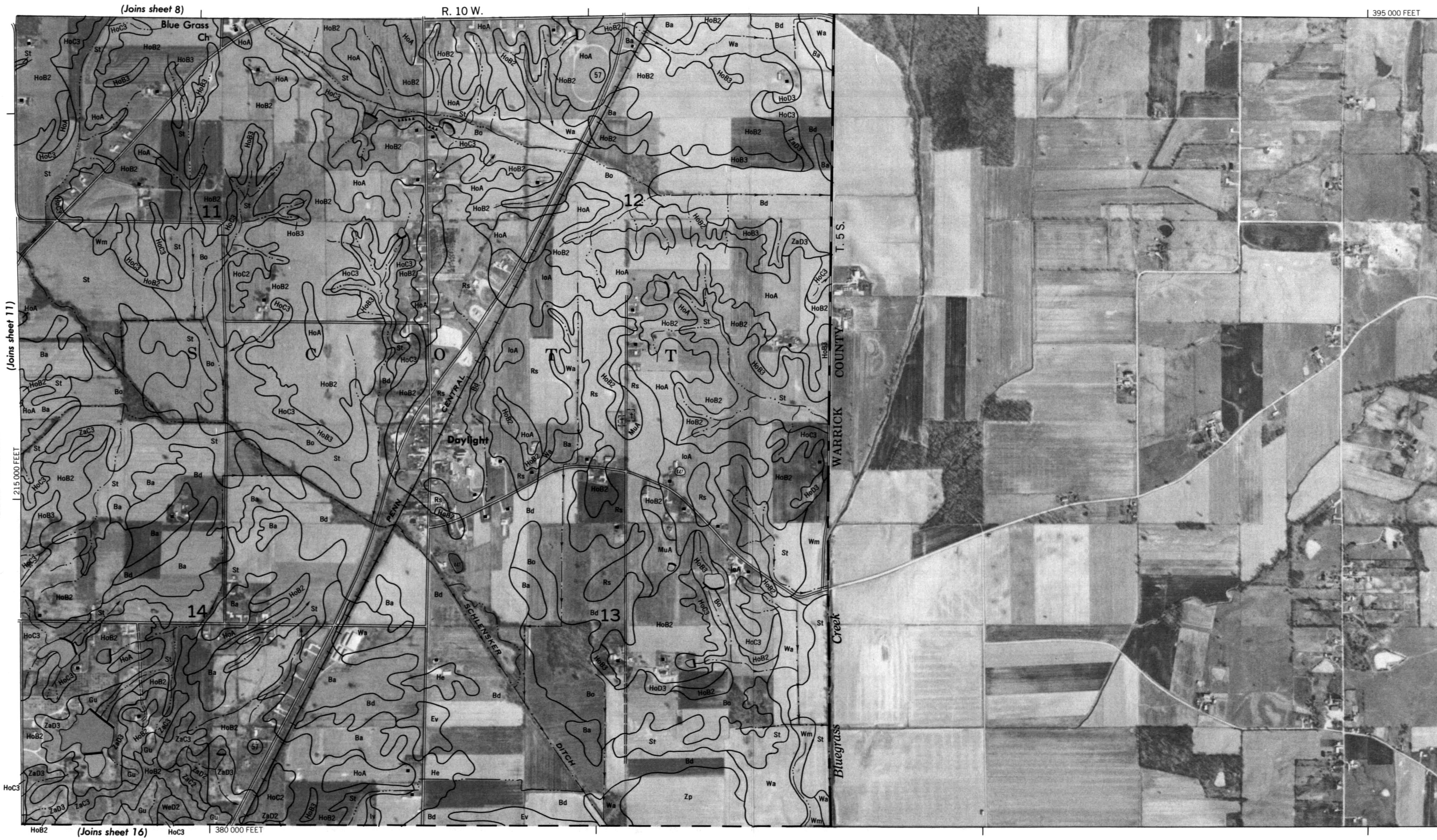
VANDERBURGH COUNTY, INDIANA — SHEET NUMBER 12

N

Scale 1:15840

1 Mile | 5 000 Feet



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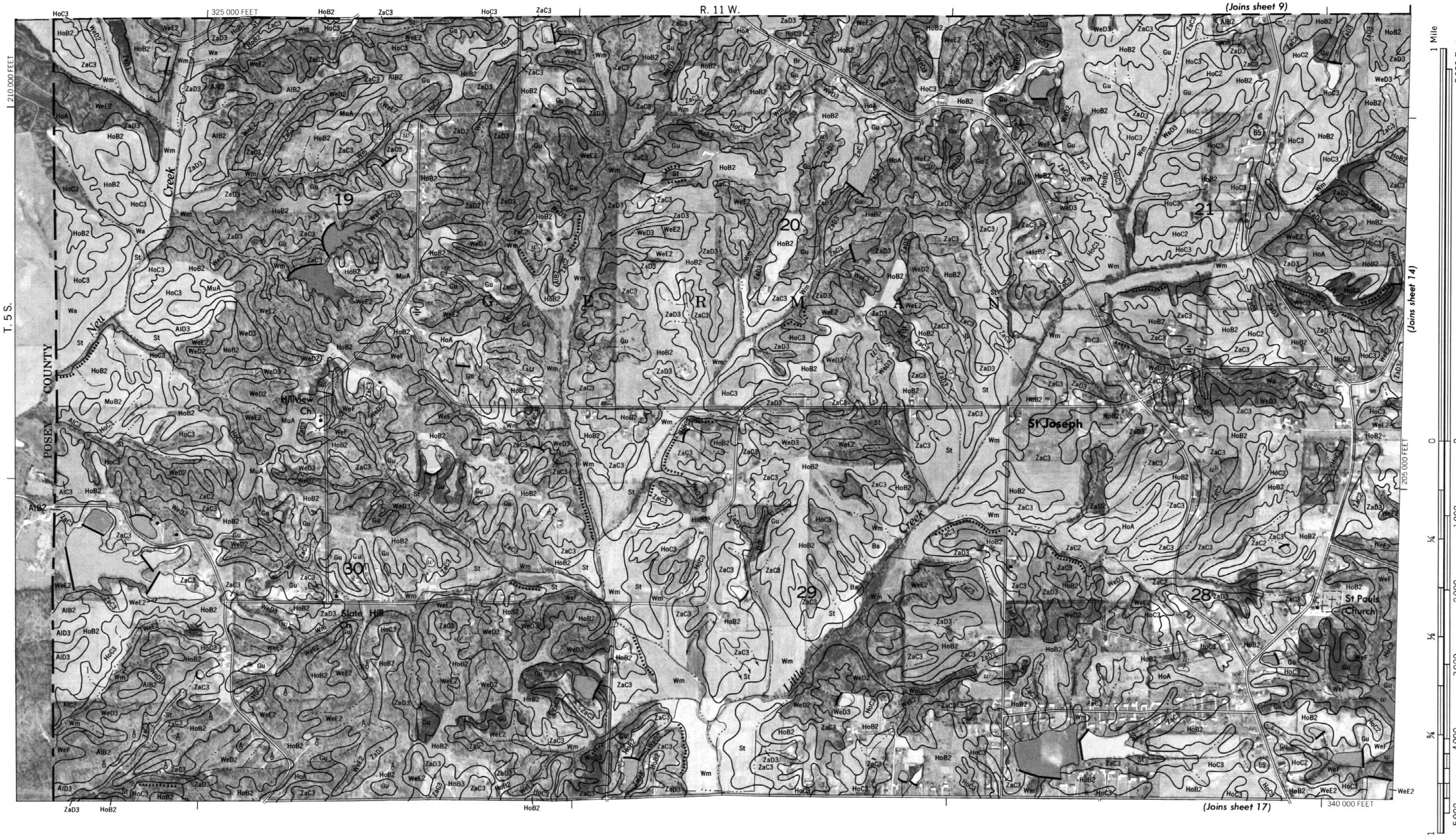

VANDERBURGH COUNTY, INDIANA — SHEET NUMBER 14

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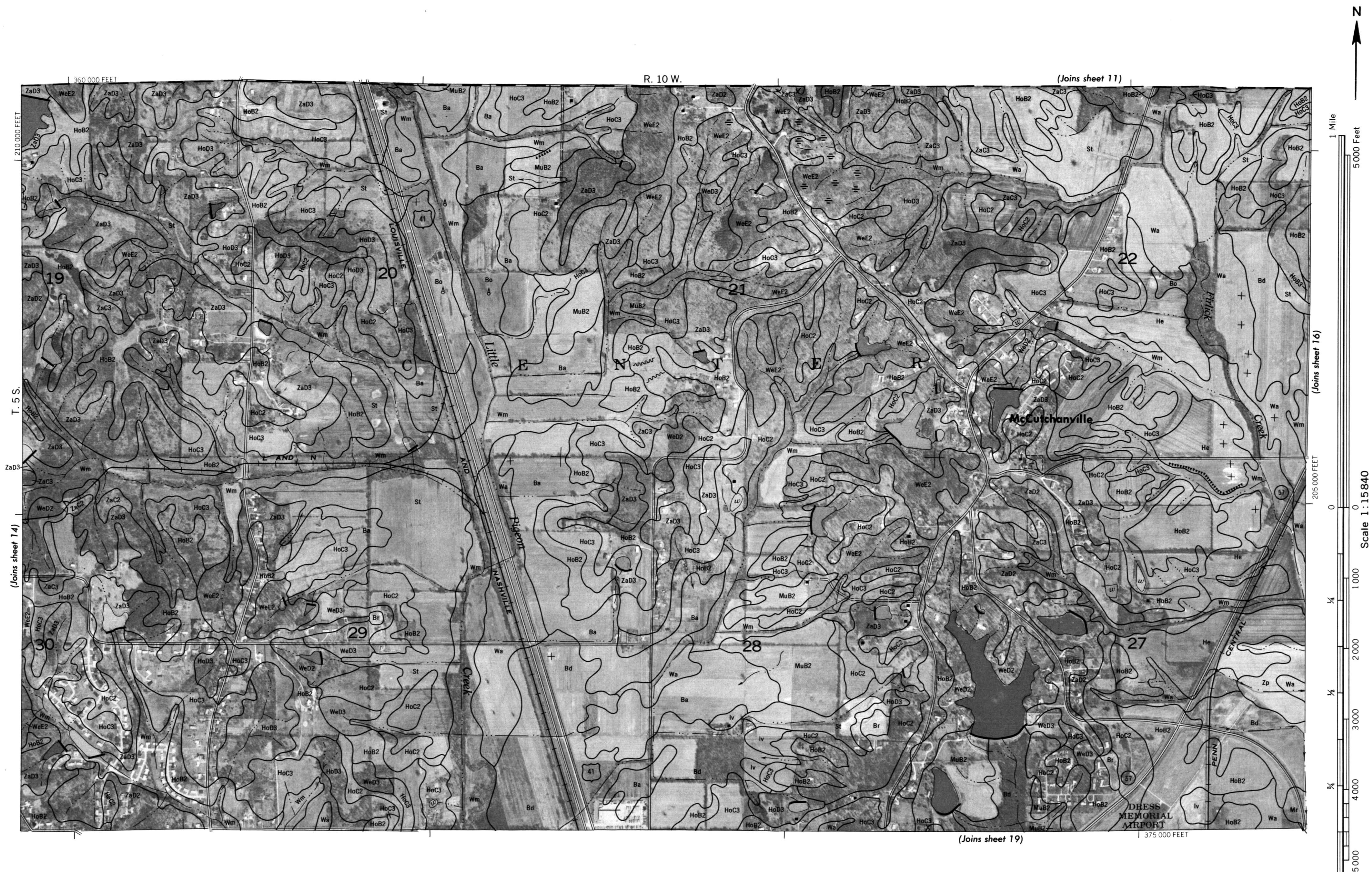

VANDERBURGH COUNTY, INDIANA NO. 15

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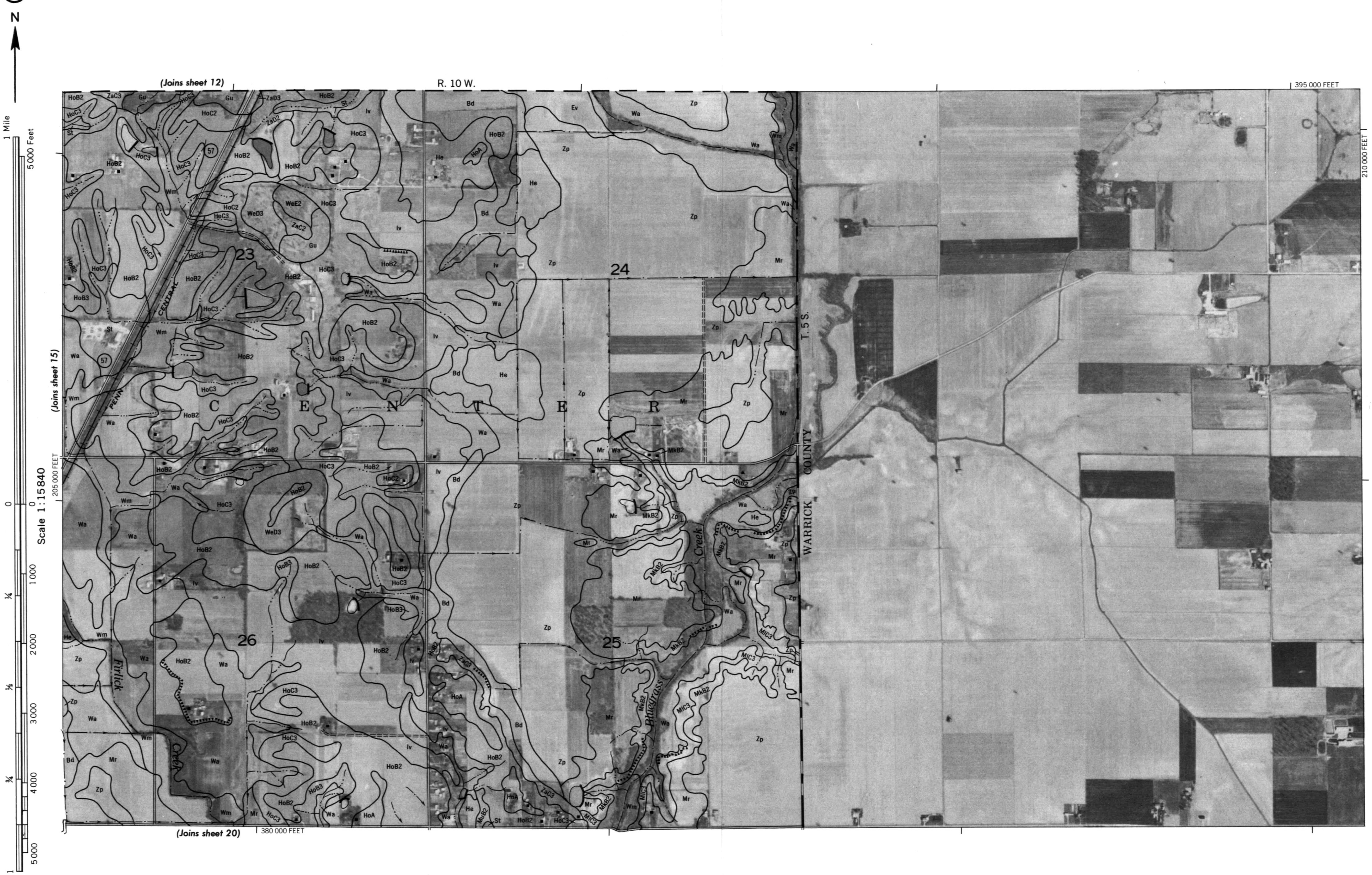

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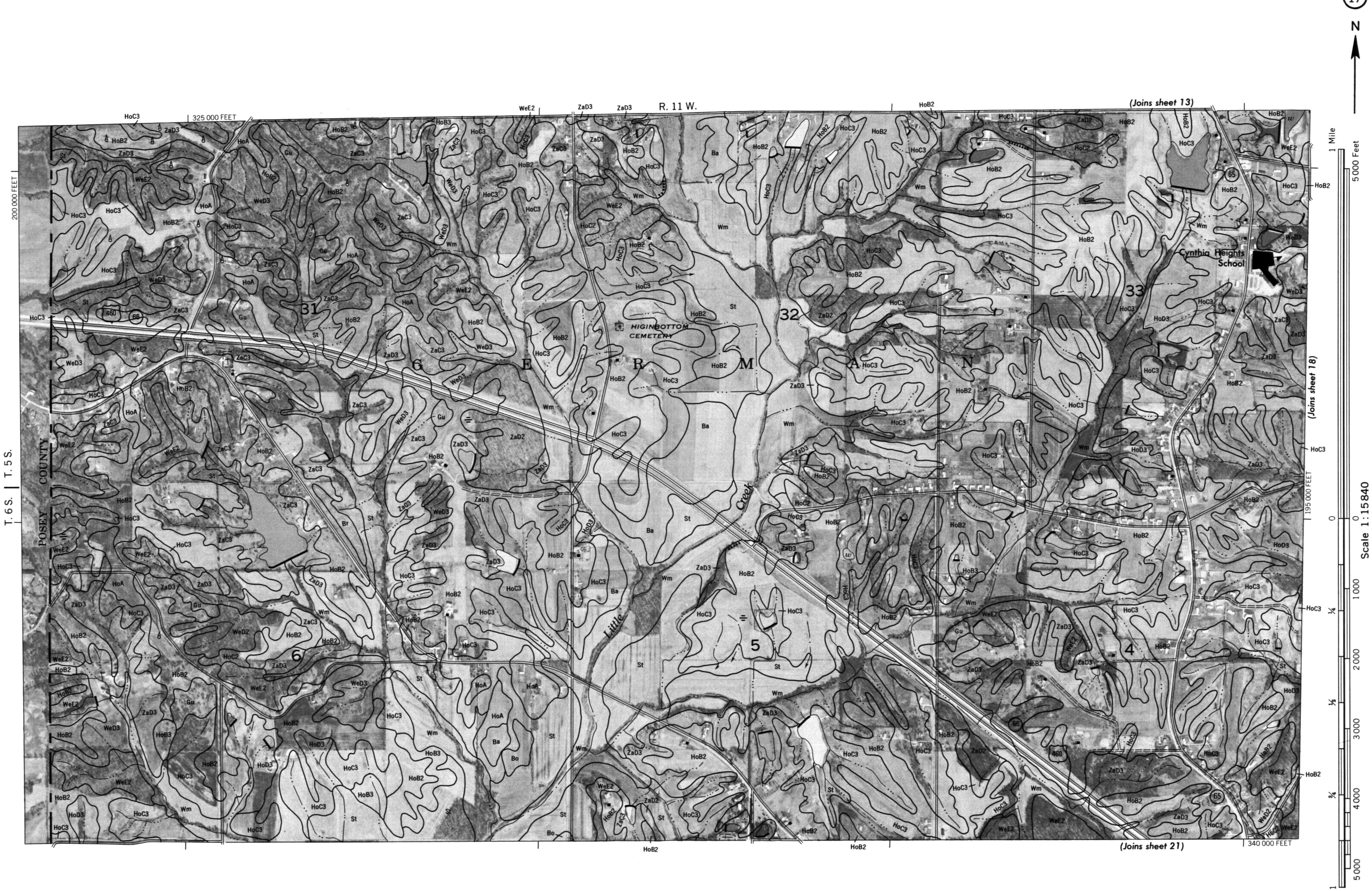

VANDERBURGH COUNTY, INDIANA NO. 17

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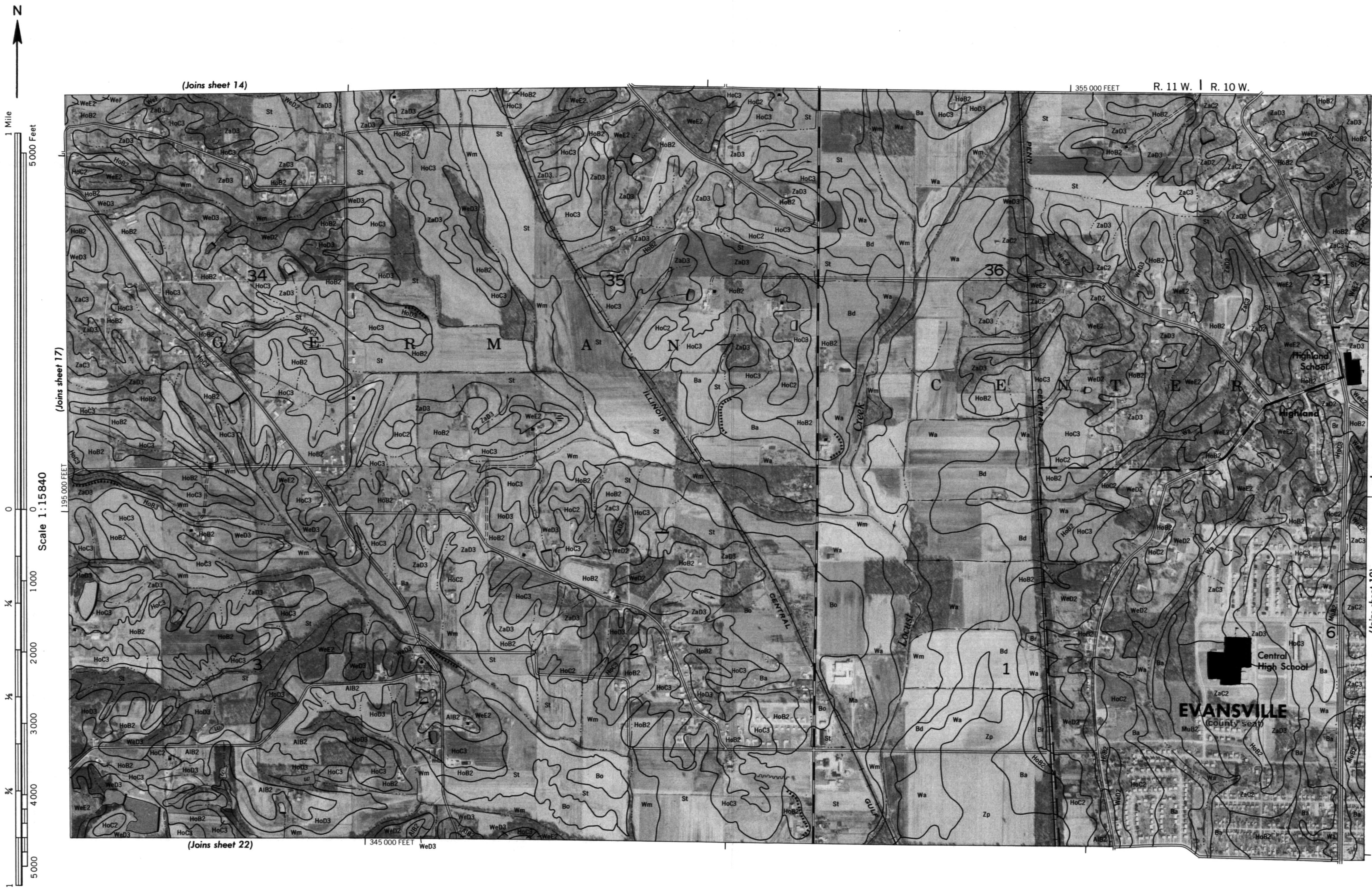
VANDERBURGH COUNTY, INDIANA — SHEET NUMBER 18



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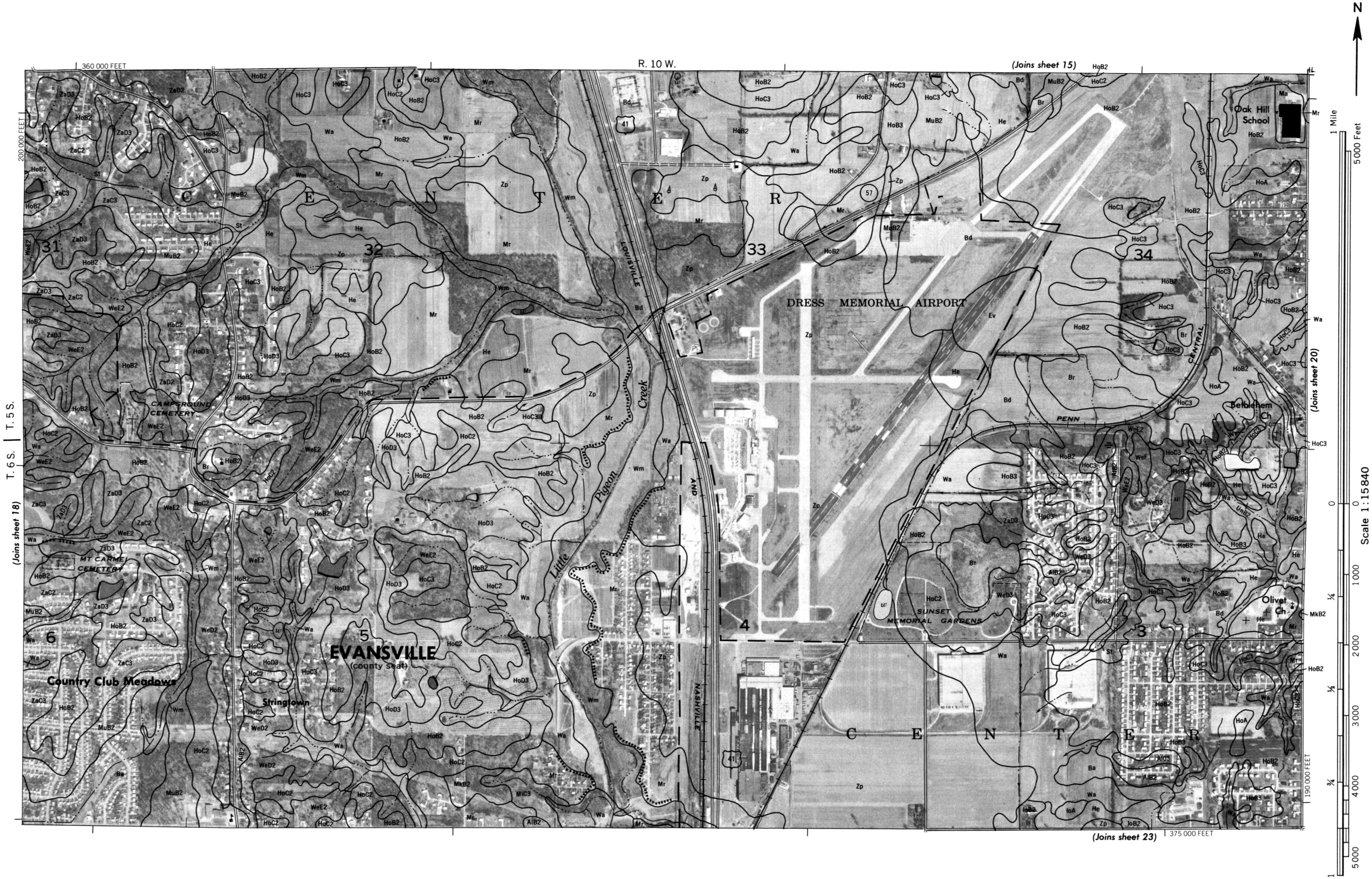

VANDERBURGH COUNTY, INDIANA NO. 19

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VANDERBURGH COUNTY, INDIANA NO. 21

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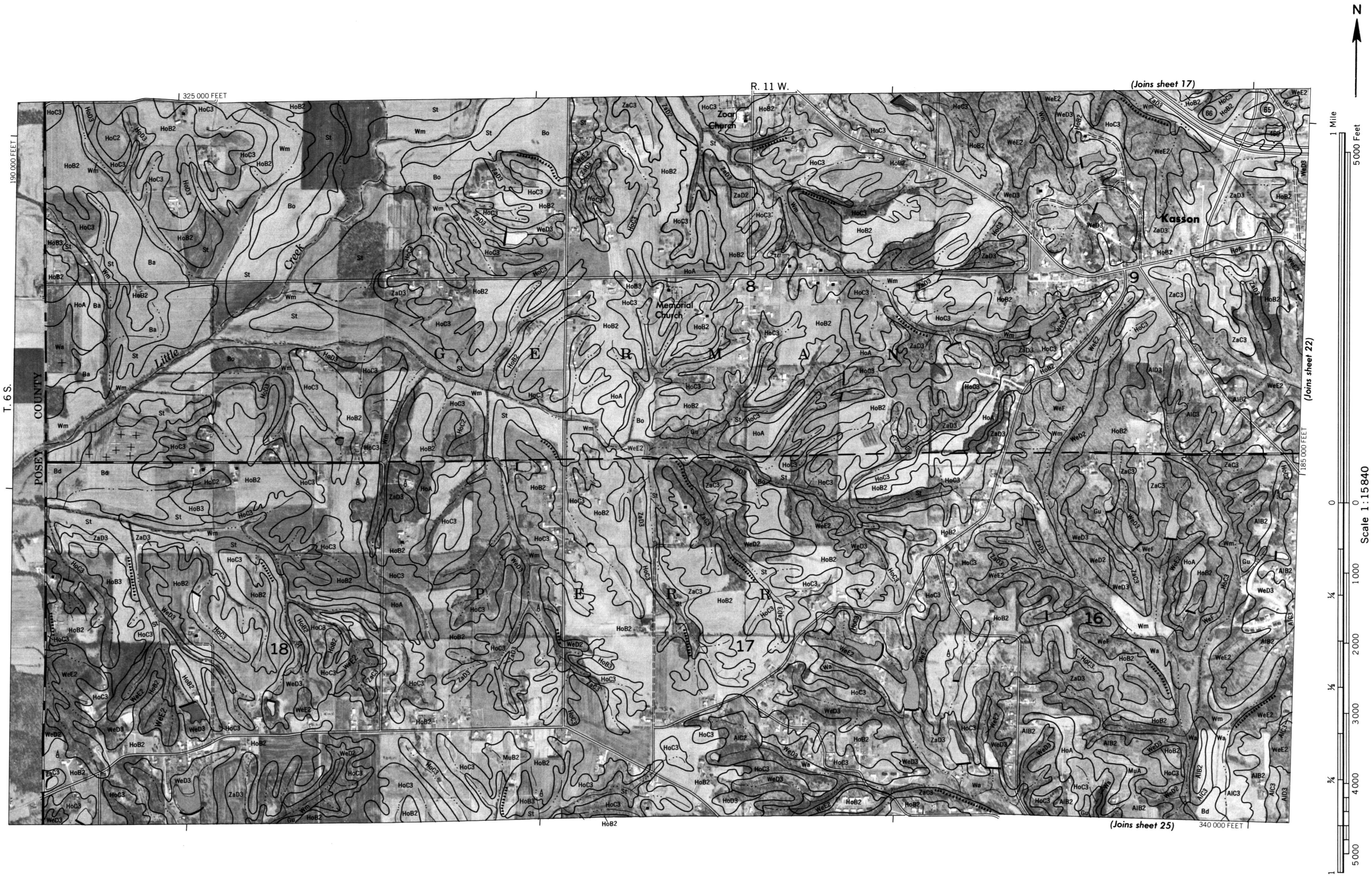
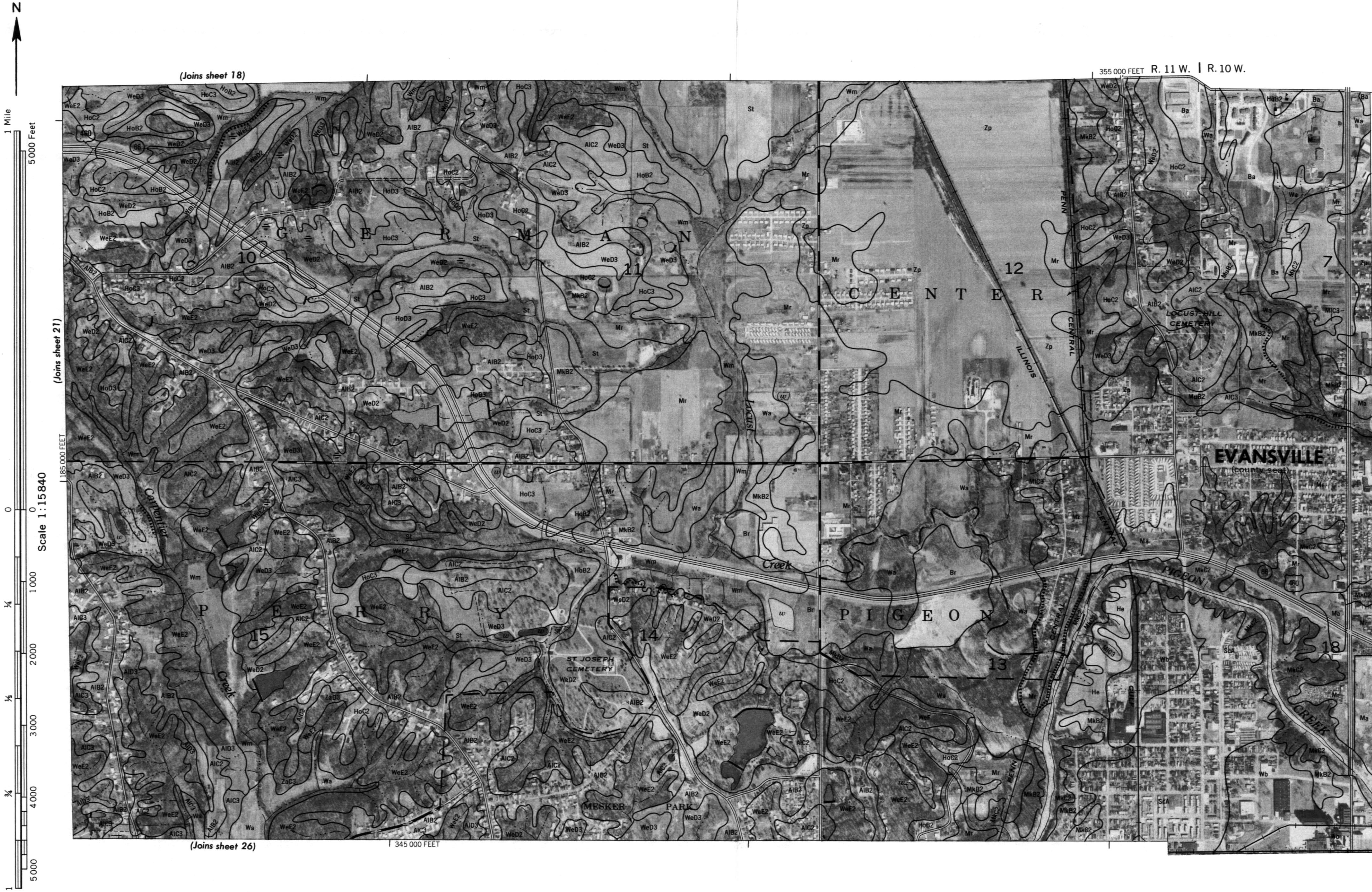


VANDERBURGH COUNTY, INDIANA — SHEET NUMBER 22



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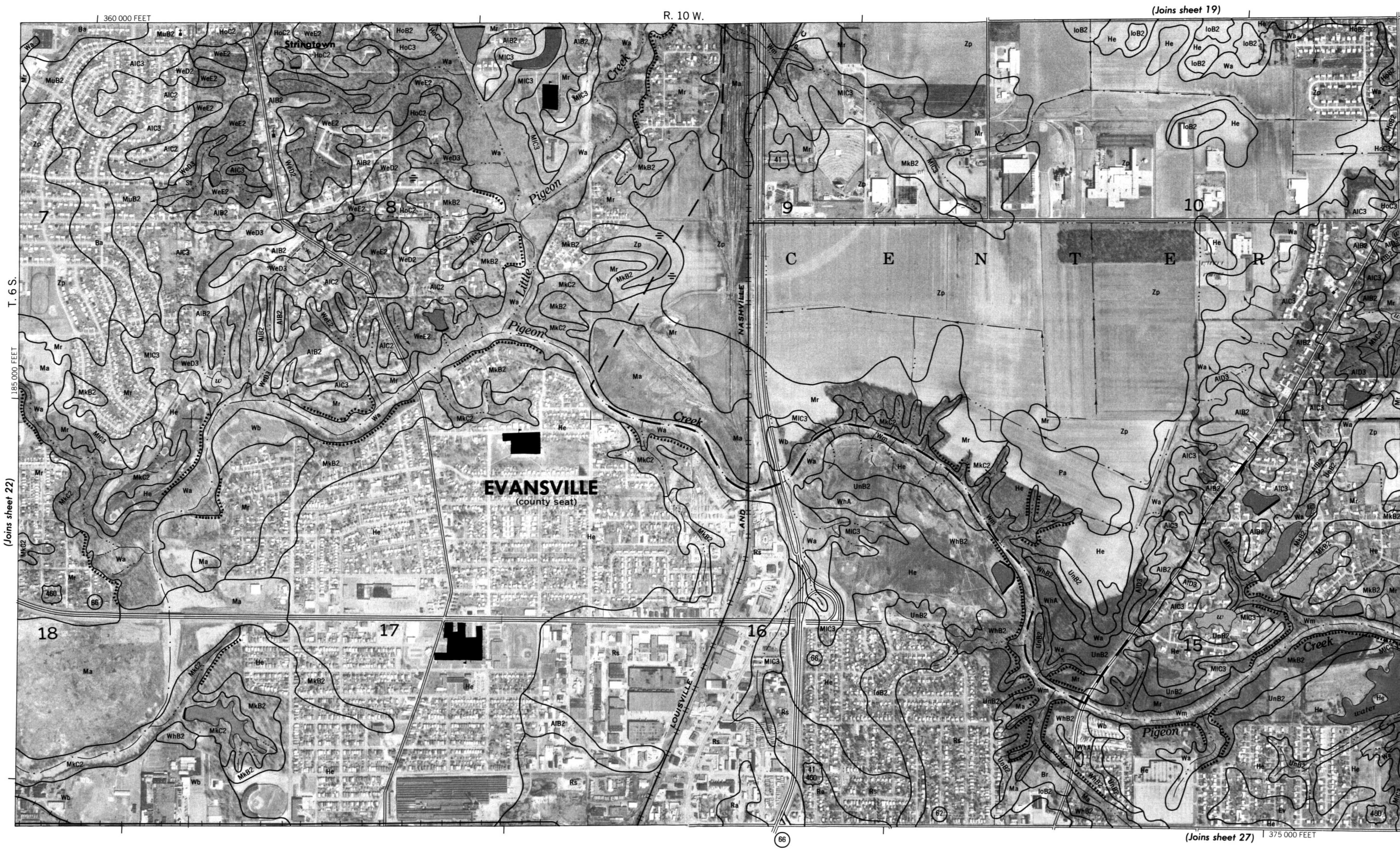
N



Scale 1:15840

1 Mile | 5000 Feet | 0 | ¼ | ½ | ¾ | 1 | 0 | 1000 | 2000 | 3000 | 4000 | 5000

VANDERBURGH COUNTY, INDIANA NO. 23

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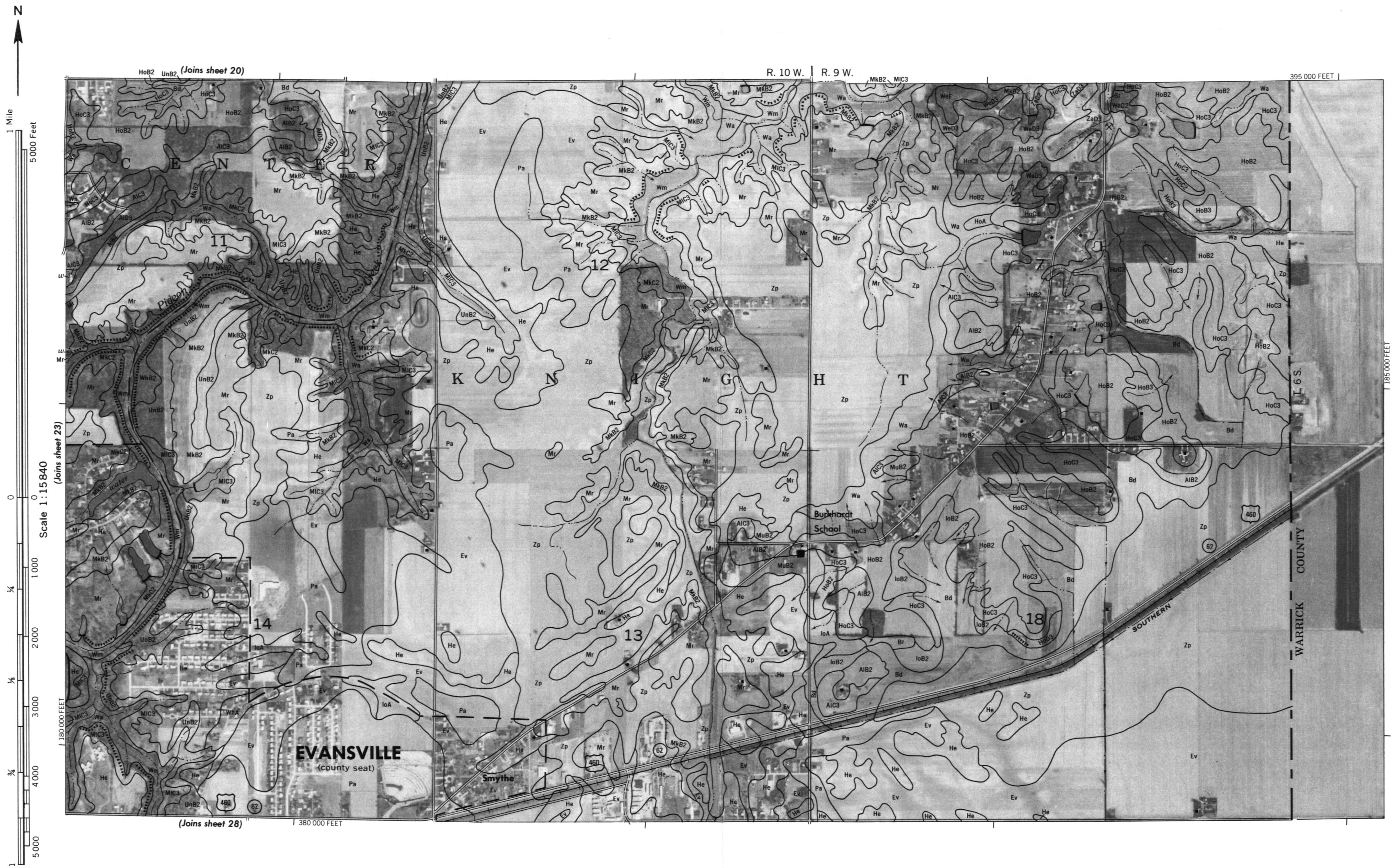
VANDERBURGH COUNTY, INDIANA — SHEET NUMBER 24



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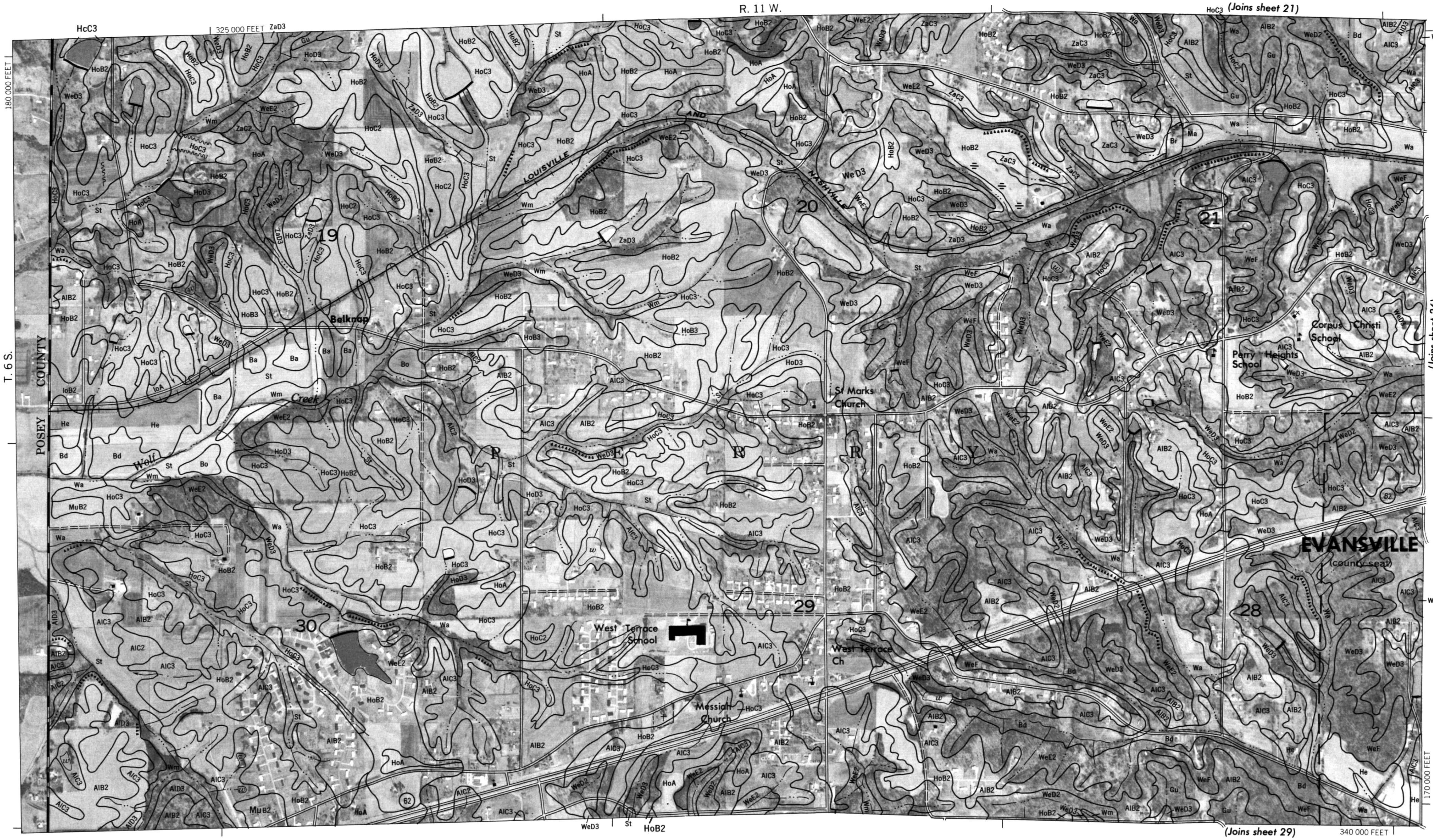

N

1 Mile

5000 Feet

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

Scale 1:15840

VANDERBURGH COUNTY, INDIANA NO. 25

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VANDERBURGH COUNTY, INDIANA — SHEET NUMBER 26

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VANDERBURGH COUNTY, INDIANA NO. 27

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Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.

VANDERBURGH COUNTY, INDIANA — SHEET NUMBER 28

N

Scale 1:15840

1 Mile
5 000 Feet
0
¼
½
¾
1
0
1000
2000
3000
4000
5 000

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

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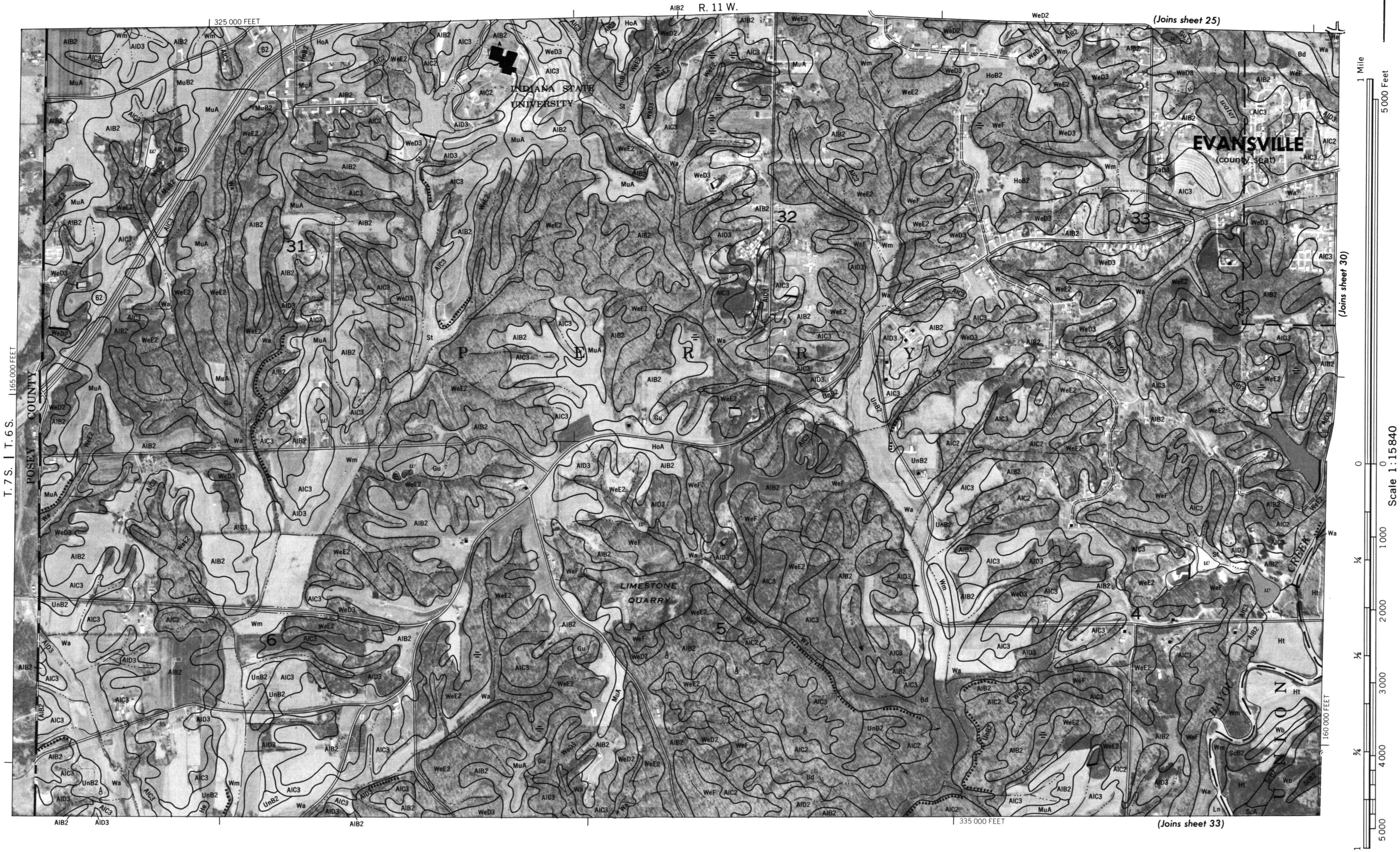

VANDERBURGH COUNTY, INDIANA NO. 29

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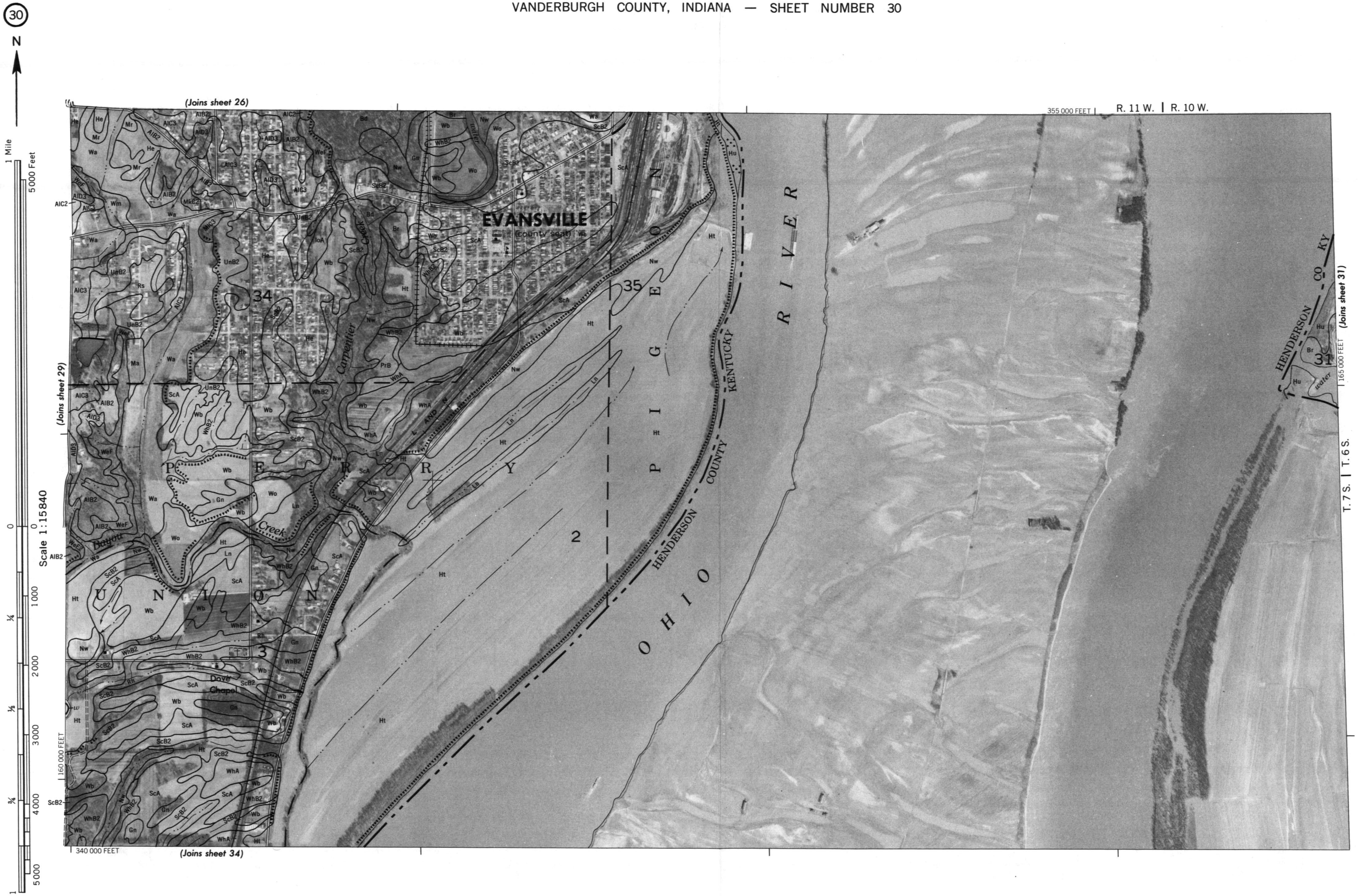

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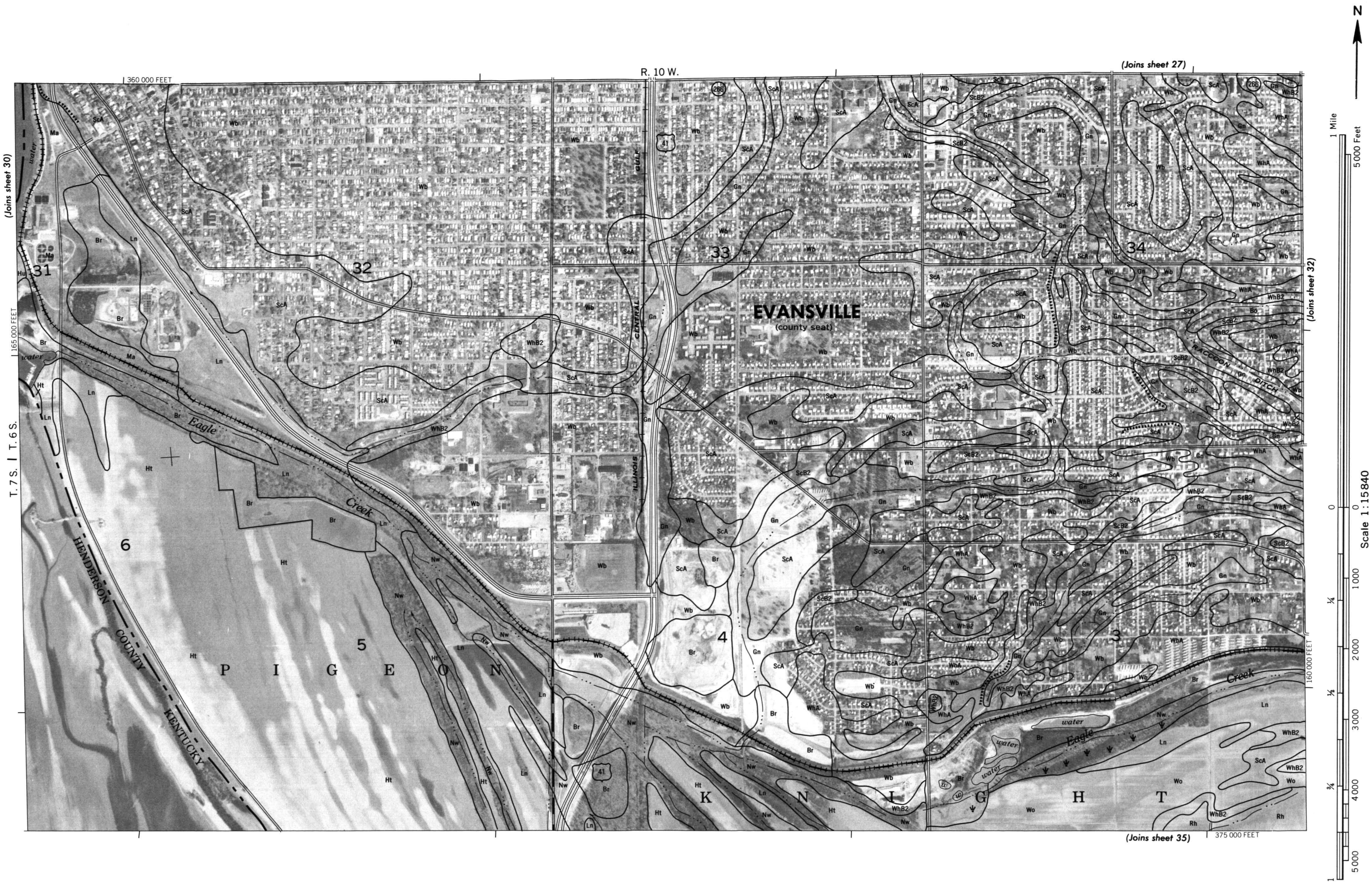
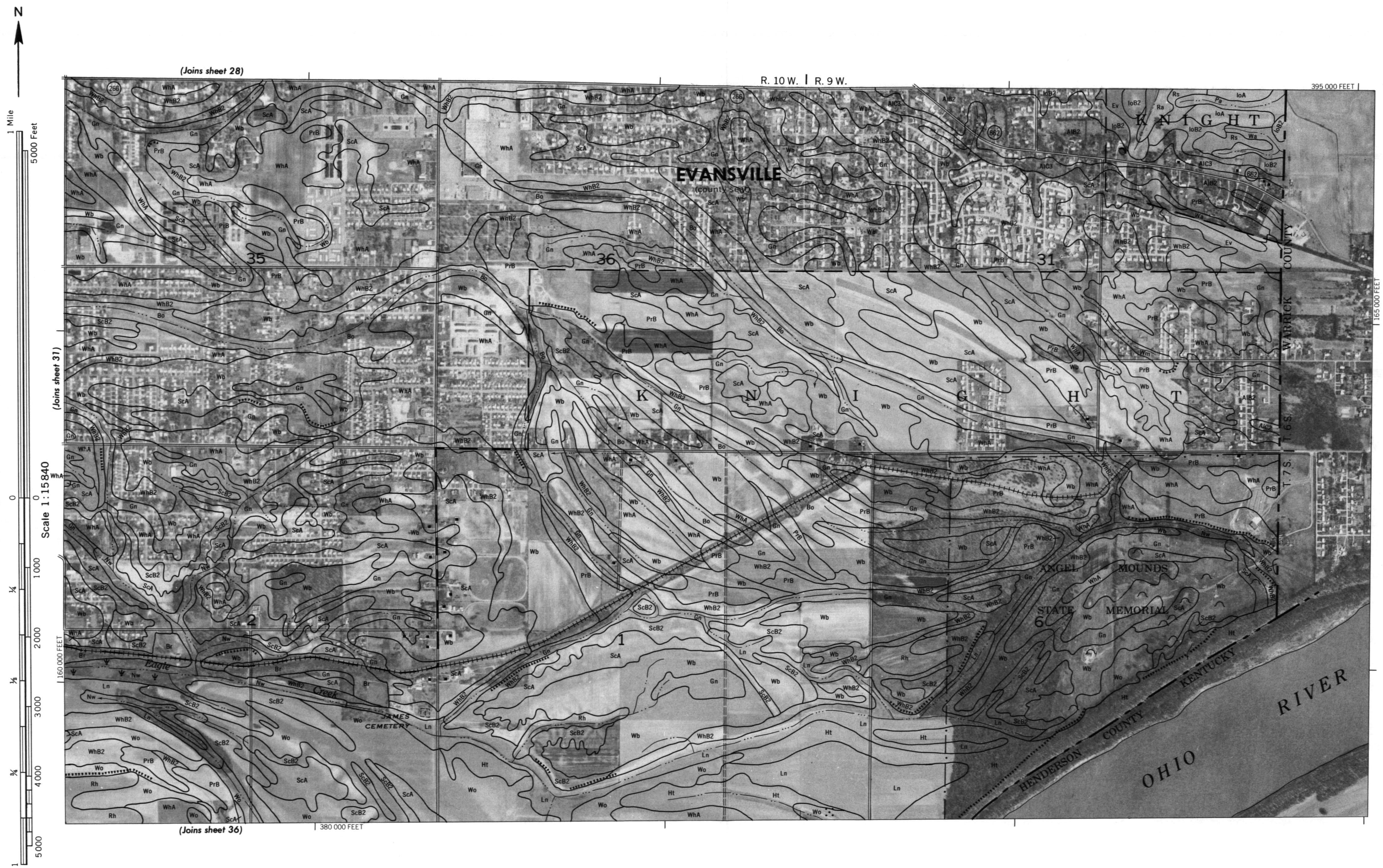
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.



VANDERBURGH COUNTY, INDIANA NO. 31

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.



Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

VANDERBURGH COUNTY, INDIANA NO. 33

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.

N

1 Mile

5000 Feet

0

Scale 1:15840

1000 2000 3000 4000 5000

¼ ½ ¾ 1

Land division corners are approximately positioned on this map.

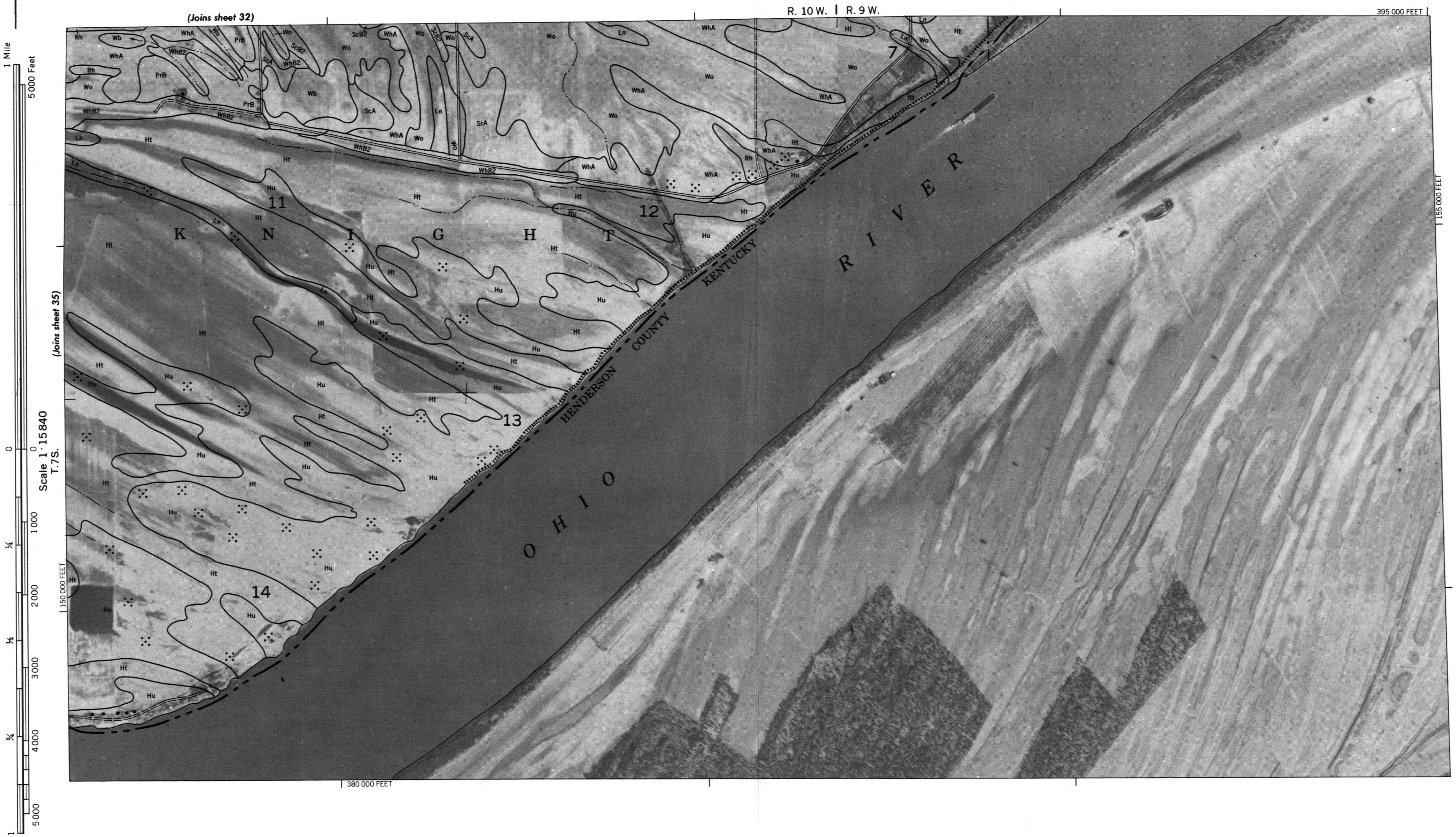
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

VANDERBURGH COUNTY, INDIANA NO. 35

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.

VANDERBURGH COUNTY, INDIANA — SHEET NUMBER 36

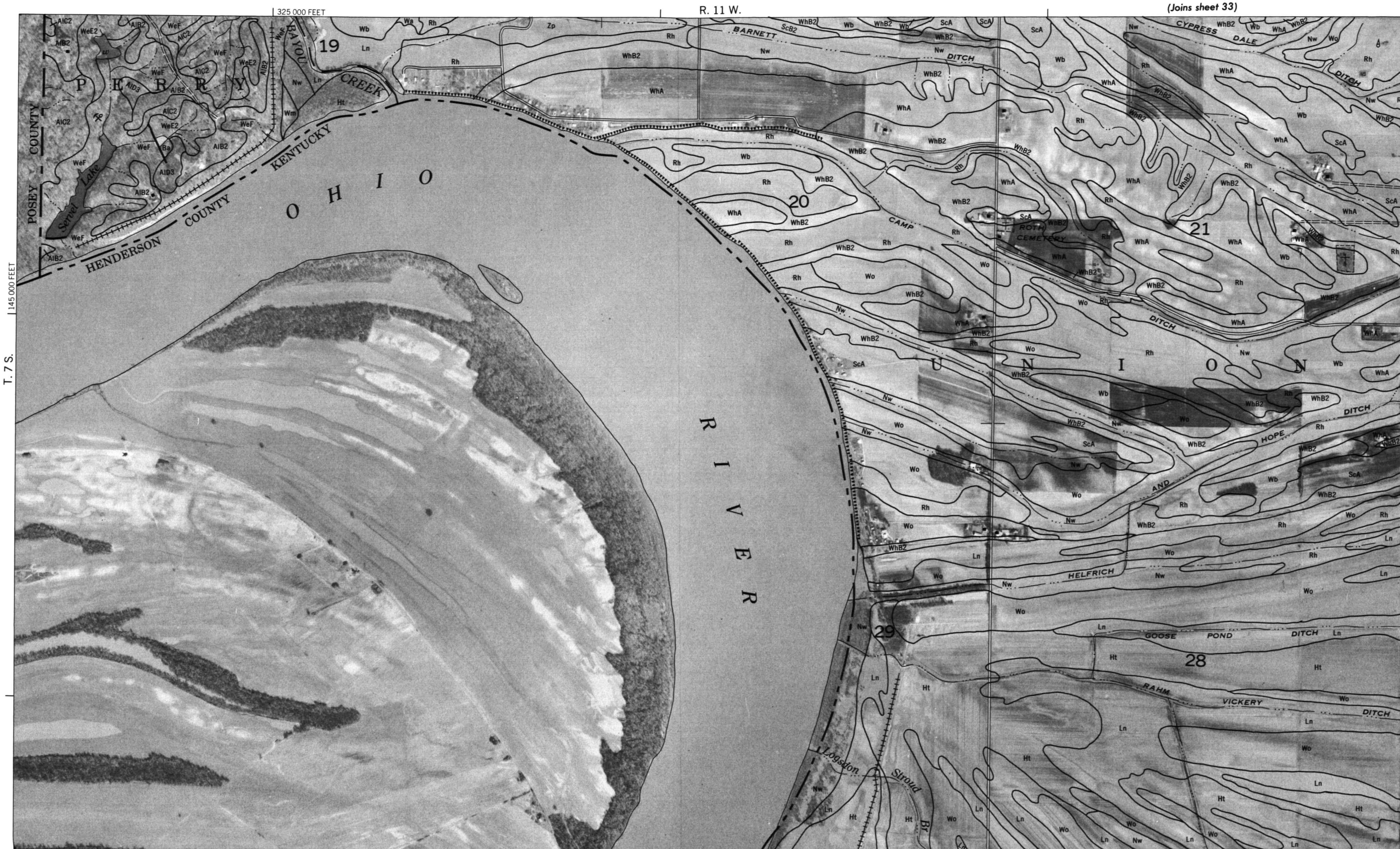


Land division corners are approximately positioned on this map.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

37

N

(Joins sheet 33)



(Joins sheet 38)

(Joins sheet 39)

1 Mile
5 000 Feet
0
1/4
1/2
3/4
1
0
1000
2000
3000
4000
5000

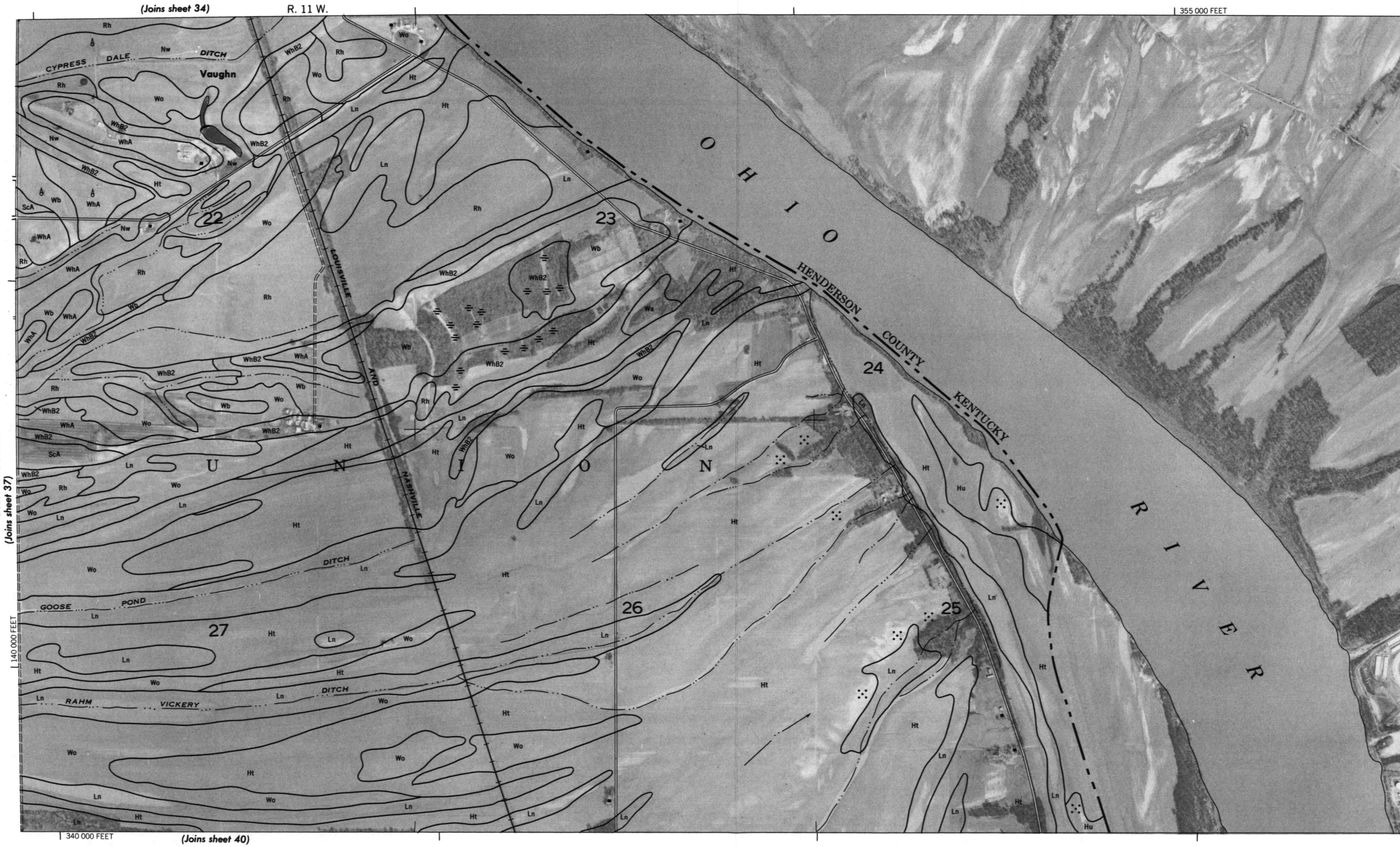
Scale 1:15840

VANDERBURGH COUNTY, INDIANA NO. 37

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.

VANDERBURGH COUNTY, INDIANA — SHEET NUMBER 38

N



Scale 1:15840

1 Mile — 5 000 Feet

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

VANDERBURGH COUNTY, INDIANA NO. 39

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.

40

N

Scale 1:15840

1 Mile

5000 Feet

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

Land division corners are approximately positioned on this map.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

VANDERBURGH COUNTY, INDIANA NO. 41

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.